

APPENDIX O

Future Scenarios' Synchro and HCS7 Files

(Synchro and HCS7 files located in electronic Appendix O folder)

O1: Year 2028 No Build Synchro AM

O2: Year 2028 No Build Synchro PM

O3: Year 2028 No Build HCS7 (Roundabout) AM & PM

O4: Year 2028 No Build with Signal Retimings AM – Synchro

O5: Year 2028 No Build with Signal Retimings PM – Synchro

O6: Year 2048 No Build AM – Synchro

O7: Year 2048 No Build PM – Synchro

O8: Year 2048 No Build HCS7 (Roundabout) AM & PM

O9: Year 2048 No Build with Signal Retimings AM – Synchro

O10: Year 2048 No Build with Signal Retimings PM – Synchro

O11: Year 2028 Build with Short Term Improvements AM – Synchro

O12: Year 2028 Build with Short Term Improvements PM – Synchro

O13: Year 2048 Build with Short Term Improvements AM – Synchro

O14: Year 2048 Build with Short Term Improvements PM – Synchro

O15: Year 2048 Build with Long Term Improvements AM – Synchro

O16: Year 2048 Build with Long Term Improvements PM – Synchro

O17: Year 2048 Build HCS7 (Roundabout) AM & PM

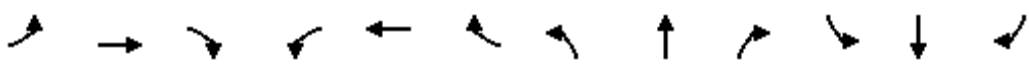
APPENDIX O1

Year 2028 No Build Synchro AM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	550	210	160	490	0	0	0	0	130	0	460
Future Volume (vph)	0	550	210	160	490	0	0	0	0	130	0	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1792	1524	1719	1810	0	0	0	0	0	1656	1482
Flt Permitted				0.104							0.950	
Satd. Flow (perm)	0	1792	1524	188	1810	0	0	0	0	0	1656	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			229									211
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	1%	1%	1%	9%	9%	9%
Adj. Flow (vph)	0	705	269	205	628	0	0	0	0	167	0	590
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	705	269	205	628	0	0	0	0	0	167	590
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		38.0	38.0	16.0	54.0					46.0	46.0	46.0
Total Split (%)		38.0%	38.0%	16.0%	54.0%					46.0%	46.0%	46.0%
Maximum Green (s)		31.5	31.5	9.5	47.5					40.0	40.0	40.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		34.4	34.4	50.1	50.1						32.9	32.9
Actuated g/C Ratio		0.38	0.38	0.55	0.55						0.36	0.36
v/c Ratio		1.04	0.38	0.69	0.63						0.28	0.88
Control Delay		77.6	6.9	44.2	19.7						21.2	32.8
Queue Delay		0.0	0.0	0.0	2.8						0.0	0.0
Total Delay		77.6	6.9	44.2	22.5						21.2	32.8
LOS		E	A	D	C						C	C
Approach Delay		58.1			27.8						30.2	
Approach LOS		E			C						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 91.1

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 40.0

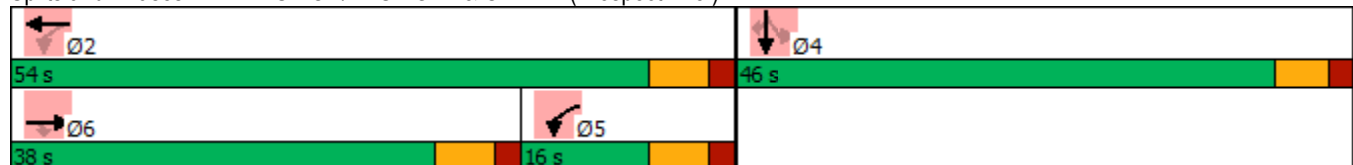
Intersection LOS: D

Intersection Capacity Utilization 64.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

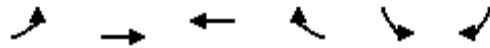
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	550	210	160	490	0	0	0	0	130	0	460
Future Volume (veh/h)	0	550	210	160	490	0	0	0	0	130	0	460
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1811	1811	1826	1826	0				1767	1767	1767
Adj Flow Rate, veh/h	0	705	269	205	628	0				167	0	590
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	6	6	5	5	0				9	9	9
Cap, veh/h	0	621	526	275	912	0				707	0	629
Arrive On Green	0.00	0.34	0.34	0.12	0.50	0.00				0.42	0.00	0.42
Sat Flow, veh/h	0	1811	1535	1739	1826	0				1682	0	1497
Grp Volume(v), veh/h	0	705	269	205	628	0				167	0	590
Grp Sat Flow(s),veh/h/ln	0	1811	1535	1739	1826	0				1682	0	1497
Q Serve(g_s), s	0.0	34.0	13.9	7.0	26.0	0.0				6.3	0.0	37.4
Cycle Q Clear(g_c), s	0.0	34.0	13.9	7.0	26.0	0.0				6.3	0.0	37.4
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	621	526	275	912	0				707	0	629
V/C Ratio(X)	0.00	1.14	0.51	0.75	0.69	0.00				0.24	0.00	0.94
Avail Cap(c_a), veh/h	0	621	526	283	920	0				712	0	634
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	32.6	26.0	40.6	19.0	0.0				18.5	0.0	27.5
Incr Delay (d2), s/veh	0.0	79.7	1.2	10.1	2.4	0.0				0.2	0.0	21.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	28.1	5.1	5.5	11.1	0.0				2.5	0.0	3.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	112.3	27.1	50.7	21.4	0.0				18.7	0.0	49.2
LnGrp LOS	A	F	C	D	C	A				B	A	D
Approach Vol, veh/h		974			833						757	
Approach Delay, s/veh		88.8			28.6						42.5	
Approach LOS		F			C						D	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		53.5		45.7	15.5	38.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		47.5		40.0	9.5	31.5						
Max Q Clear Time (g_c+I1), s		28.0		39.4	9.0	36.0						
Green Ext Time (p_c), s		4.3		0.3	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			55.6									
HCM 6th LOS			E									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



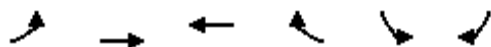
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	420	260	650	80	0	0
Future Volume (vph)	420	260	650	80	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1736	1827	1863	1583	0	0
Flt Permitted	0.177					
Satd. Flow (perm)	323	1827	1863	1583	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				98		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Adj. Flow (vph)	512	317	793	98	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	512	317	793	98	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0	20.0		
Minimum Split (s)	20.5	26.5	26.5	26.5		

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	47.2	51.2	26.3	26.3		
Actuated g/C Ratio	0.92	1.00	0.51	0.51		
v/c Ratio	0.67	0.17	0.83	0.11		
Control Delay	11.5	0.2	23.1	2.9		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	11.7	0.2	23.1	2.9		
LOS	B	A	C	A		
Approach Delay		7.3	20.9			
Approach LOS		A	C			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 51.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 14.3

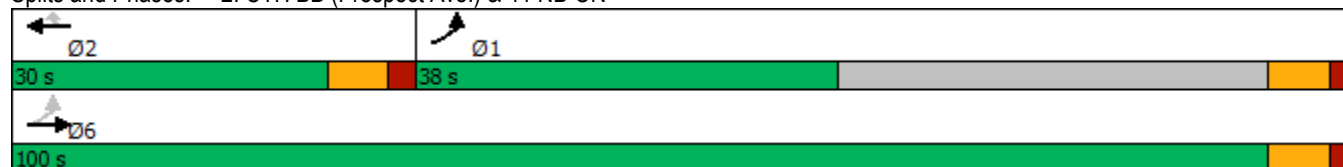
Intersection LOS: B

Intersection Capacity Utilization 64.1%

ICU Level of Service C

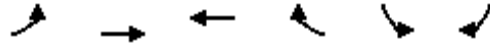
Analysis Period (min) 15

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary 2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	420	260	650	80	0	0
Future Volume (veh/h)	420	260	650	80	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1841	1841	1870	1870		
Adj Flow Rate, veh/h	512	317	793	98		
Peak Hour Factor	0.82	0.82	0.82	0.82		
Percent Heavy Veh, %	4	4	2	2		
Cap, veh/h	711	1668	993	841		
Arrive On Green	0.28	0.91	0.53	0.53		
Sat Flow, veh/h	1753	1841	1870	1585		
Grp Volume(v), veh/h	512	317	793	98		
Grp Sat Flow(s),veh/h/ln	1753	1841	1870	1585		
Q Serve(g_s), s	5.1	0.8	14.7	1.3		
Cycle Q Clear(g_c), s	5.1	0.8	14.7	1.3		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	711	1668	993	841		
V/C Ratio(X)	0.72	0.19	0.80	0.12		
Avail Cap(c_a), veh/h	1617	4147	1141	967		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	11.6	0.2	8.1	5.0		
Incr Delay (d2), s/veh	1.4	0.1	4.0	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.3	0.0	4.8	0.3		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.0	0.3	12.1	5.1		
LnGrp LOS	B	A	B	A		
Approach Vol, veh/h		829	891			
Approach Delay, s/veh		8.1	11.3			
Approach LOS		A	B			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	16.0	26.6			42.6	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	7.1	16.7			2.8	
Green Ext Time (p_c), s	2.3	3.4			2.2	
Intersection Summary						
HCM 6th Ctrl Delay			9.8			
HCM 6th LOS			A			

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	260	0	0	520	210	450
Future Volume (vph)	260	0	0	520	210	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1845	0	0	1881	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1845	0	0	1881	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						529
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	1%	1%	2%	2%
Adj. Flow (vph)	310	0	0	619	250	536
Shared Lane Traffic (%)						
Lane Group Flow (vph)	310	0	0	619	250	536
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
Page 7

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Walk Time (s)	5.0			5.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		
Act Effct Green (s)	28.5			28.5	17.5	17.5
Actuated g/C Ratio	0.52			0.52	0.32	0.32
v/c Ratio	0.32			0.63	0.44	0.62
Control Delay	9.1			13.2	18.5	5.5
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.1			13.2	18.5	5.5
LOS	A			B	B	A
Approach Delay	9.1			13.2	9.7	
Approach LOS	A			B	A	
Intersection Summary						
Area Type:	Other					
Cycle Length: 100						
Actuated Cycle Length: 54.4						
Natural Cycle: 45						
Control Type: Actuated-Uncoordinated						
Maximum v/c Ratio: 0.63						
Intersection Signal Delay: 10.8				Intersection LOS: B		
Intersection Capacity Utilization 51.2%				ICU Level of Service A		
Analysis Period (min) 15						

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)

← Ø2	↖ Ø4
59 s	41 s
→ Ø6	
59 s	

HCM 6th Signalized Intersection Summary

3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	260	0	0	520	210	450
Future Volume (veh/h)	260	0	0	520	210	450
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1885	1870	1870
Adj Flow Rate, veh/h	310	0	0	619	250	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	0	0	1	2	2
Cap, veh/h	985	0	0	1001	492	
Arrive On Green	0.53	0.00	0.00	0.53	0.28	0.00
Sat Flow, veh/h	1856	0	0	1885	1781	1585
Grp Volume(v), veh/h	310	0	0	619	250	0
Grp Sat Flow(s),veh/h/ln	1856	0	0	1885	1781	1585
Q Serve(g_s), s	3.9	0.0	0.0	9.5	4.9	0.0
Cycle Q Clear(g_c), s	3.9	0.0	0.0	9.5	4.9	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	985	0	0	1001	492	
V/C Ratio(X)	0.31	0.00	0.00	0.62	0.51	
Avail Cap(c_a), veh/h	2463	0	0	2502	1591	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.5	0.0	0.0	6.8	12.6	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.9	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.0	2.6	1.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.7	0.0	0.0	7.7	13.4	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	310			619	250	A
Approach Delay, s/veh	5.7			7.7	13.4	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	26.0		15.4		26.0	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	11.5		6.9		5.9	
Green Ext Time (p_c), s	5.0		1.0		2.1	
Intersection Summary						
HCM 6th Ctrl Delay			8.4			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	550	160	290	660	0	0	0	0	210	0	340
Future Volume (vph)	0	550	160	290	660	0	0	0	0	210	0	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0			450		450
Storage Lanes	0		1	1		0	0			1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			186									395
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	640	186	337	767	0	0	0	0	244	0	395
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	640	186	337	767	0	0	0	0	0	244	395
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	5.0	5.0					7.0	7.0	7.0
Minimum Split (s)		9.0	9.0	10.0	11.0					13.0	13.0	13.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.39	0.29	0.52	0.30					0.76	0.47	0.47
Control Delay		27.3	5.1	41.3	4.3					55.5	5.6	5.6
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		27.3	5.1	41.3	4.3					55.5	5.6	5.6
LOS		C	A	D	A					E	A	A
Approach Delay		22.3			15.6					24.7		
Approach LOS		C			B					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 20.0

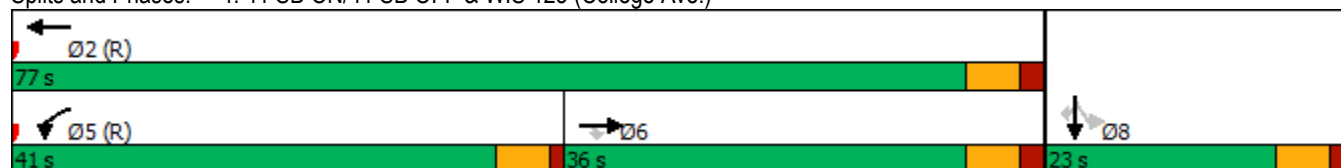
Intersection LOS: C

Intersection Capacity Utilization 42.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	550	160	290	660	0	0	0	0	210	0	340
Future Volume (veh/h)	0	550	160	290	660	0	0	0	0	210	0	340
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	640	0	337	767	0				244	0	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86				0.86	0.86	0.86
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	2382		398	2594	0				677	0	
Arrive On Green	0.00	0.15	0.00	0.22	0.73	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1781	3647	0				3563	0	3170
Grp Volume(v), veh/h	0	640	0	337	767	0				244	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	11.1	0.0	18.1	7.4	0.0				6.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	11.1	0.0	18.1	7.4	0.0				6.0	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2382		398	2594	0				677	0	
V/C Ratio(X)	0.00	0.27		0.85	0.30	0.00				0.36	0.00	
Avail Cap(c_a), veh/h	0	2382		659	2594	0				677	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.79	0.79	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	27.3	0.0	37.2	4.6	0.0				35.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	4.3	0.2	0.0				1.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.1	0.0	8.2	2.3	0.0				2.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	27.5	0.0	41.5	4.9	0.0				36.7	0.0	0.0
LnGrp LOS	A	C		D	A	A				D	A	
Approach Vol, veh/h		640	A		1104						244	A
Approach Delay, s/veh		27.5			16.1						36.7	
Approach LOS		C			B						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		77.0			26.4	50.6		23.0				
Change Period (Y+Rc), s		6.0			5.0	6.0		6.0				
Max Green Setting (Gmax), s		71.0			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		9.4			20.1	13.1		8.0				
Green Ext Time (p_c), s		4.2			1.2	2.9		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			22.3									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	580	0	0	650	120	300	0	430	0	0	0
Future Volume (vph)	180	580	0	0	650	120	300	0	430	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.237						0.950					
Satd. Flow (perm)	446	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						140			530			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	209	674	0	0	756	140	349	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	209	674	0	0	756	140	349	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	72.0			37.0	37.0	28.0	28.0	28.0			
Total Split (%)	35.0%	72.0%			37.0%	37.0%	28.0%	28.0%	28.0%			
Maximum Green (s)	29.0	66.0			31.0	31.0	23.0	23.0	23.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	68.0	68.0			33.0	33.0	24.0		24.0			
Actuated g/C Ratio	0.68	0.68			0.33	0.33	0.24		0.24			
v/c Ratio	0.29	0.28			0.45	0.23	0.87		0.47			
Control Delay	20.8	6.5			27.4	5.2	59.1		3.7			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	20.8	6.5			27.4	5.2	59.1		3.7			
LOS	C	A			C	A	E		A			
Approach Delay	9.9				24.0		26.5					
Approach LOS	A				C		C					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 20.0

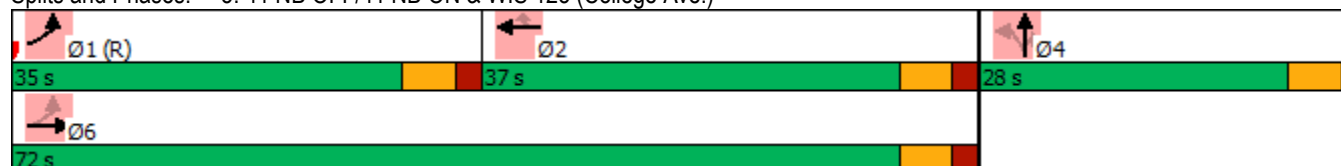
Intersection LOS: C

Intersection Capacity Utilization 42.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	580	0	0	650	120	300	0	430	0	0	0
Future Volume (veh/h)	180	580	0	0	650	120	300	0	430	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	209	674	0	0	756	0	349	0	0			
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	538	2436	0	0	2795		855	0				
Arrive On Green	0.09	0.68	0.00	0.00	0.18	0.00	0.24	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	209	674	0	0	756	0	349	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	4.5	7.4	0.0	0.0	12.8	0.0	8.3	0.0	0.0			
Cycle Q Clear(g_c), s	4.5	7.4	0.0	0.0	12.8	0.0	8.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	538	2436	0	0	2795		855	0				
V/C Ratio(X)	0.39	0.28	0.00	0.00	0.27		0.41	0.00				
Avail Cap(c_a), veh/h	928	2436	0	0	2795		855	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.93	0.93	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	8.1	6.3	0.0	0.0	23.8	0.0	32.0	0.0	0.0			
Incr Delay (d2), s/veh	0.4	0.3	0.0	0.0	0.2	0.0	1.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.6	2.6	0.0	0.0	5.8	0.0	3.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.5	6.6	0.0	0.0	24.0	0.0	33.5	0.0	0.0			
LnGrp LOS	A	A	A	A	C		C	A				
Approach Vol, veh/h	883			756			A			349		
Approach Delay, s/veh	7.0			24.0			33.5					
Approach LOS	A			C			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	13.3	58.7		28.0		72.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	31.0		23.0		66.0						
Max Q Clear Time (g_c+I1), s	6.5	14.8		10.3		9.4						
Green Ext Time (p_c), s	0.8	3.4		1.3		3.5						

Intersection Summary

HCM 6th Ctrl Delay 18.1

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	650	210	380	650	0	0	0	0	160	0	290
Future Volume (vph)	0	650	210	380	650	0	0	0	0	160	0	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1770	1583
Flt Permitted				0.181							0.950	
Satd. Flow (perm)	0	5085	1583	337	3539	0	0	0	0	0	1770	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			269									231
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	833	269	487	833	0	0	0	0	205	0	372
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	833	269	487	833	0	0	0	0	0	205	372
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

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Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	73.7	73.7						18.3	18.3
Actuated g/C Ratio		0.30	0.30	0.74	0.74						0.18	0.18
v/c Ratio		0.55	0.41	0.60	0.32						0.63	0.78
Control Delay		30.9	5.4	7.3	0.5						46.3	26.1
Queue Delay		0.0	0.0	1.2	0.5						0.0	0.0
Total Delay		31.0	5.4	8.5	1.1						46.3	26.1
LOS		C	A	A	A						D	C
Approach Delay		24.7			3.8						33.2	
Approach LOS		C			A						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 17.2

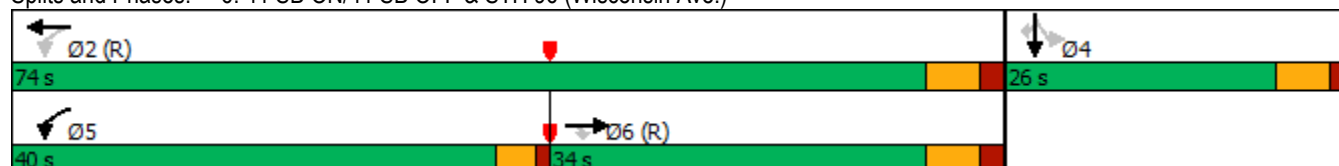
Intersection LOS: B

Intersection Capacity Utilization 52.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary
6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (veh/h)	0	650	210	380	650	0	0	0	0	160	0	290
Future Volume (veh/h)	0	650	210	380	650	0	0	0	0	160	0	290
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	833	0	487	833	0				205	0	372
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1532		808	2488	0				392	0	349
Arrive On Green	0.00	0.30	0.00	0.72	1.00	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1781	0	1585
Grp Volume(v), veh/h	0	833	0	487	833	0				205	0	372
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	13.6	0.0	9.0	0.0	0.0				10.1	0.0	22.0
Cycle Q Clear(g_c), s	0.0	13.6	0.0	9.0	0.0	0.0				10.1	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		808	2488	0				392	0	349
V/C Ratio(X)	0.00	0.54		0.60	0.33	0.00				0.52	0.00	1.07
Avail Cap(c_a), veh/h	0	1532		808	2488	0				392	0	349
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.65	0.65	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	29.3	0.0	4.0	0.0	0.0				34.4	0.0	39.0
Incr Delay (d2), s/veh	0.0	1.4	0.0	2.2	0.2	0.0				1.3	0.0	67.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.7	0.0	2.1	0.1	0.0				4.5	0.0	23.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	30.7	0.0	6.2	0.2	0.0				35.6	0.0	106.0
LnGrp LOS	A	C		A	A	A				D	A	F
Approach Vol, veh/h		833	A		1320						577	
Approach Delay, s/veh		30.7			2.4						81.0	
Approach LOS		C			A						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		2.0		24.0	11.0	15.6						
Green Ext Time (p_c), s		7.5		0.0	1.2	4.7						
Intersection Summary												
HCM 6th Ctrl Delay			27.7									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	640	0	0	740	70	290	0	380	0	0	0
Future Volume (vph)	170	640	0	0	740	70	290	0	380	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.150						0.950					
Satd. Flow (perm)	279	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						86			251			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	210	790	0	0	914	86	358	0	469	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	210	790	0	0	914	86	358	0	469	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	0.29	0.32			0.60	0.16	0.97		0.86			
Control Delay	1.5	2.9			31.8	6.6	80.2		34.6			
Queue Delay	0.0	0.7			0.0	0.0	0.0		0.0			
Total Delay	1.5	3.6			31.9	6.6	80.2		34.6			
LOS	A	A			C	A	F		C			
Approach Delay		3.2			29.7			54.3				
Approach LOS		A			C			D				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 27.5

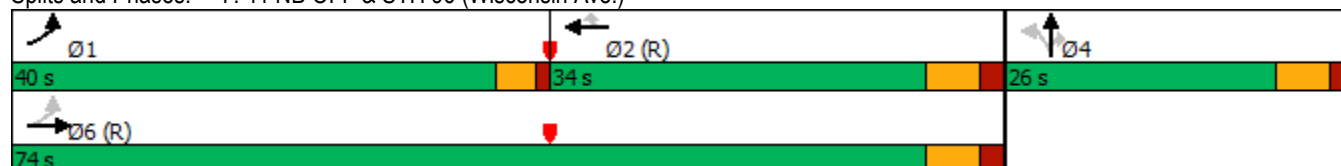
Intersection LOS: C

Intersection Capacity Utilization 52.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	170	640	0	0	740	70	290	0	380	0	0	0
Future Volume (veh/h)	170	640	0	0	740	70	290	0	380	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	210	790	0	0	914	86	358	0	0			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	836	2750	0	0	1909	593	521	0				
Arrive On Green	0.24	0.52	0.00	0.00	0.37	0.37	0.15	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	210	790	0	0	914	86	358	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	4.0	12.6	0.0	0.0	13.7	3.6	9.5	0.0	0.0			
Cycle Q Clear(g_c), s	4.0	12.6	0.0	0.0	13.7	3.6	9.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	836	2750	0	0	1909	593	521	0				
V/C Ratio(X)	0.25	0.29	0.00	0.00	0.48	0.15	0.69	0.00				
Avail Cap(c_a), veh/h	836	2750	0	0	1909	593	784	0				
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.82	0.82	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	7.4	8.5	0.0	0.0	23.9	20.7	40.5	0.0	0.0			
Incr Delay (d2), s/veh	0.6	0.2	0.0	0.0	0.9	0.5	1.6	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.4	5.4	0.0	0.0	5.5	1.4	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.0	8.7	0.0	0.0	24.7	21.2	42.2	0.0	0.0			
LnGrp LOS	A	A	A	A	C	C	D	A				
Approach Vol, veh/h	1000			1000			358			A		
Approach Delay, s/veh	8.5			24.4			42.2					
Approach LOS	A			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	41.4		18.6		81.4						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	6.0	15.7		11.5		14.6						
Green Ext Time (p_c), s	0.5	5.5		1.1		6.9						

Intersection Summary

HCM 6th Ctrl Delay	20.4
HCM 6th LOS	C

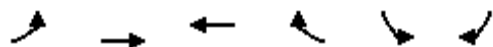
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019

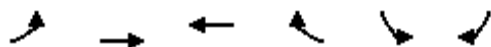


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	200	1240	650	380	190	810
Future Volume (vph)	200	1240	650	380	190	810
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1763	3539	3505	1568	1770	1583
Flt Permitted	0.150				0.950	
Satd. Flow (perm)	278	3539	3505	1568	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				500		276
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	263	1632	855	500	250	1066
Shared Lane Traffic (%)						
Lane Group Flow (vph)	263	1632	855	500	250	1066
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	16.0
Total Split (s)	15.0	45.0	45.0	45.0	40.0	40.0
Total Split (%)	15.0%	45.0%	45.0%	45.0%	40.0%	40.0%
Maximum Green (s)	10.0	39.0	39.0	39.0	34.0	34.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	Min	Min	Min	None	None
Act Effct Green (s)	48.1	48.1	33.0	33.0	36.1	36.1
Actuated g/C Ratio	0.52	0.52	0.36	0.36	0.39	0.39
v/c Ratio	0.82	0.89	0.68	0.57	0.36	1.35
Control Delay	36.9	26.4	28.0	4.6	22.9	188.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.9	26.4	28.0	4.6	22.9	188.8
LOS	D	C	C	A	C	F
Approach Delay		27.9	19.4		157.3	
Approach LOS		C	B		F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 92.2

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.35

Intersection Signal Delay: 62.7

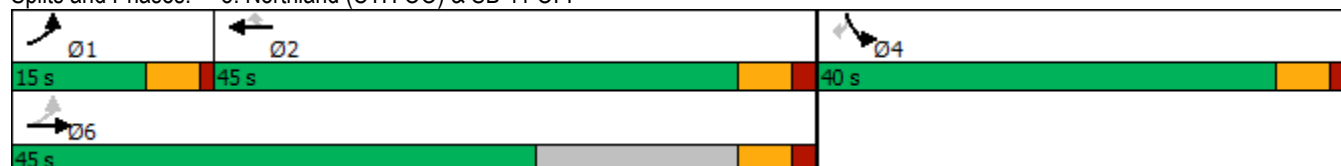
Intersection LOS: E

Intersection Capacity Utilization 74.8%

ICU Level of Service D

Analysis Period (min) 15

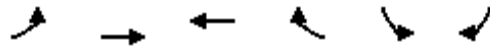
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	200	1240	650	380	190	810
Future Volume (veh/h)	200	1240	650	380	190	810
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	263	1632	855	0	250	0
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	522	2231	1440		400	
Arrive On Green	0.15	0.63	0.41	0.00	0.22	0.00
Sat Flow, veh/h	1781	3647	3618	1572	1781	1585
Grp Volume(v), veh/h	263	1632	855	0	250	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1763	1572	1781	1585
Q Serve(g_s), s	4.0	17.1	10.2	0.0	6.9	0.0
Cycle Q Clear(g_c), s	4.0	17.1	10.2	0.0	6.9	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	522	2231	1440		400	
V/C Ratio(X)	0.50	0.73	0.59		0.63	
Avail Cap(c_a), veh/h	625	2693	2671		1185	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	8.1	6.9	12.5	0.0	18.9	0.0
Incr Delay (d2), s/veh	0.8	1.0	0.4	0.0	2.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	4.4	3.5	0.0	2.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.9	7.9	12.9	0.0	21.2	0.0
LnGrp LOS	A	A	B		C	
Approach Vol, veh/h		1895	855	A	250	A
Approach Delay, s/veh		8.1	12.9		21.2	
Approach LOS		A	B		C	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	11.9	26.1		16.1		38.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	10.0	39.0		34.0		39.0
Max Q Clear Time (g_c+I1), s	6.0	12.2		8.9		19.1
Green Ext Time (p_c), s	0.4	4.5		1.5		12.9

Intersection Summary

HCM 6th Ctrl Delay	10.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	600	830	0	0	840	150	190	0	440	0	0	0
Future Volume (vph)	600	830	0	0	840	150	190	0	440	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	3574	0	0	3539	1583	0	1671	1495	0	0	0
Flt Permitted	0.106							0.950				
Satd. Flow (perm)	199	3574	0	0	3539	1583	0	1671	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						197			130			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	789	1092	0	0	1105	197	250	0	579	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	789	1092	0	0	1105	197	0	250	579	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0	10.0			
Minimum Split (s)	12.0	26.0			36.0	36.0	20.0	20.0	20.0			

7:00 am Baseline

Synchro 10 Report
Page 7

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	40.0			40.0	40.0	25.0	25.0	25.0			
Total Split (%)	27.8%	44.4%			44.4%	44.4%	27.8%	27.8%	27.8%			
Maximum Green (s)	20.0	34.0			34.0	34.0	19.0	19.0	19.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0	4.0			
Recall Mode	None	Min			Min	Min	None	None	None			
Act Effct Green (s)	59.7	59.7			34.7	34.7		21.0	21.0			
Actuated g/C Ratio	0.67	0.67			0.39	0.39		0.24	0.24			
v/c Ratio	1.55	0.45			0.80	0.27		0.63	1.28			
Control Delay	279.7	7.5			29.2	3.7		39.1	166.8			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	279.7	7.5			29.2	3.7		39.1	166.8			
LOS	F	A			C	A		D	F			
Approach Delay	121.7				25.3		128.3					
Approach LOS	F				C		F					

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 88.7

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.55

Intersection Signal Delay: 91.8

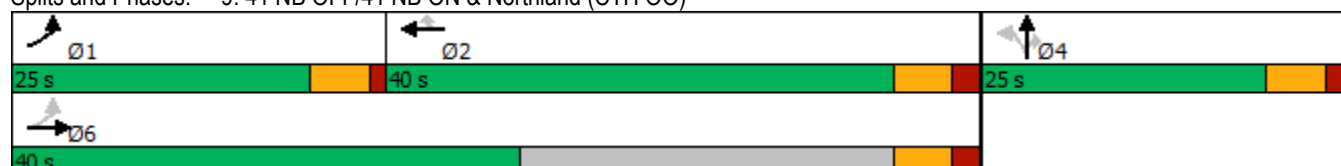
Intersection LOS: F

Intersection Capacity Utilization 77.0%

ICU Level of Service D

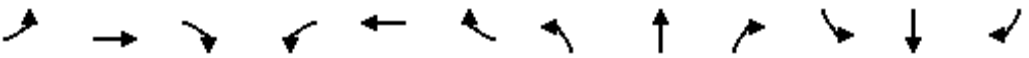
Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary 9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	600	830	0	0	840	150	190	0	440	0	0	0
Future Volume (veh/h)	600	830	0	0	840	150	190	0	440	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781			
Adj Flow Rate, veh/h	789	1092	0	0	1105	0	250	0	0			
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76			
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8			
Cap, veh/h	614	2520	0	0	1393		334	0				
Arrive On Green	0.26	0.70	0.00	0.00	0.39	0.00	0.20	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3647	1585	1697	0	1510			
Grp Volume(v), veh/h	789	1092	0	0	1105	0	250	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1777	1585	1697	0	1510			
Q Serve(g_s), s	21.0	10.4	0.0	0.0	22.0	0.0	11.1	0.0	0.0			
Cycle Q Clear(g_c), s	21.0	10.4	0.0	0.0	22.0	0.0	11.1	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	614	2520	0	0	1393		334	0				
V/C Ratio(X)	1.29	0.43	0.00	0.00	0.79		0.75	0.00				
Avail Cap(c_a), veh/h	614	2520	0	0	1595		444	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	20.5	5.1	0.0	0.0	21.5	0.0	30.4	0.0	0.0			
Incr Delay (d2), s/veh	140.5	0.1	0.0	0.0	2.8	0.0	6.0	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	35.0	3.0	0.0	0.0	9.1	0.0	5.0	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	161.0	5.2	0.0	0.0	24.3	0.0	36.4	0.0	0.0			
LnGrp LOS	F	A	A	A	C		D	A				
Approach Vol, veh/h	1881			1105			A			250		
Approach Delay, s/veh	70.5			24.3			36.4					
Approach LOS	E			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	25.0	35.4		19.8		60.4						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	20.0	34.0		19.0		34.0						
Max Q Clear Time (g_c+I1), s	23.0	24.0		13.1		12.4						
Green Ext Time (p_c), s	0.0	5.4		0.7		5.8						

Intersection Summary

HCM 6th Ctrl Delay	52.1
HCM 6th LOS	D

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frts						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	0	150	0	0	0	0	560	420	300	620	0
Future Volume (vph)	270	0	150	0	0	0	0	560	420	300	620	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.172		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3539	1583	324	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			281						467			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	300	0	167	0	0	0	0	622	467	333	689	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	300	0	167	0	0	0	0	622	467	333	689	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effct Green (s)	16.1		16.1					26.0	26.0	75.9	75.9	
Actuated g/C Ratio	0.16		0.16					0.26	0.26	0.76	0.76	
v/c Ratio	0.54		0.34					0.68	0.62	0.36	0.25	
Control Delay	41.7		1.9					37.6	6.9	5.9	0.2	
Queue Delay	0.0		0.0					0.0	0.0	0.0	0.0	
Total Delay	41.7		1.9					37.6	6.9	5.9	0.2	
LOS	D		A					D	A	A	A	
Approach Delay		27.5						24.4			2.1	
Approach LOS		C						C			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 16.1

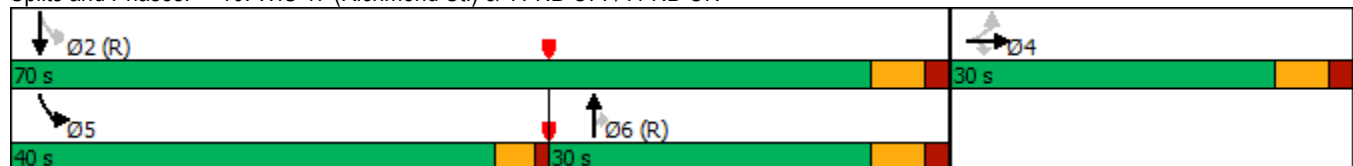
Intersection LOS: B

Intersection Capacity Utilization 67.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	270	0	150	0	0	0	0	560	420	300	620	0
Future Volume (veh/h)	270	0	150	0	0	0	0	560	420	300	620	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	300	0	0				0	622	0	333	689	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1				0	2	2	1	1	0
Cap, veh/h	463	251					0	1375		910	2819	0
Arrive On Green	0.13	0.00	0.00				0.00	0.39	0.00	0.12	0.26	0.00
Sat Flow, veh/h	3483	1885	1598				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	300	0	0				0	622	0	333	689	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1777	1585	1795	1791	0
Q Serve(g_s), s	8.2	0.0	0.0				0.0	13.0	0.0	6.9	15.2	0.0
Cycle Q Clear(g_c), s	8.2	0.0	0.0				0.0	13.0	0.0	6.9	15.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	463	251					0	1375		910	2819	0
V/C Ratio(X)	0.65	0.00					0.00	0.45		0.37	0.24	0.00
Avail Cap(c_a), veh/h	906	490					0	1375		910	2819	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.75	0.75	0.00
Uniform Delay (d), s/veh	41.1	0.0	0.0				0.0	22.8	0.0	9.2	13.5	0.0
Incr Delay (d2), s/veh	1.5	0.0	0.0				0.0	1.1	0.0	0.9	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	0.0	0.0				0.0	5.5	0.0	2.7	7.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.7	0.0	0.0				0.0	23.8	0.0	10.0	13.7	0.0
LnGrp LOS	D	A					A	C		B	B	A
Approach Vol, veh/h	300		A					622	A	1022		
Approach Delay, s/veh	42.7							23.8		12.5		
Approach LOS	D							C		B		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	82.7			17.3	40.0	42.7						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	64.0			24.0	36.0	24.0						
Max Q Clear Time (g_c+I1), s	17.2			10.2	8.9	15.0						
Green Ext Time (p_c), s	2.0			1.1	0.8	3.6						
Intersection Summary												
HCM 6th Ctrl Delay	20.8											
HCM 6th LOS	C											

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	280	0	240	380	450	0	0	640	460
Future Volume (vph)	0	0	0	280	0	240	380	450	0	0	640	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.168					
Satd. Flow (perm)	0	0	0	3433	1863	1583	316	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						396						529
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	322	0	276	437	517	0	0	736	529
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	322	0	276	437	517	0	0	736	529
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

7:00 am Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				17.2		17.2	74.8	74.8			32.0	32.0
Actuated g/C Ratio				0.17		0.17	0.75	0.75			0.32	0.32
v/c Ratio				0.55		0.46	0.54	0.19			0.65	0.61
Control Delay				40.9		2.7	3.4	0.4			32.4	5.7
Queue Delay				0.0		0.0	0.3	0.0			0.0	0.0
Total Delay				40.9		2.7	3.8	0.4			32.4	5.7
LOS				D		A	A	A			C	A
Approach Delay					23.3			1.9			21.3	
Approach LOS					C			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 15.2

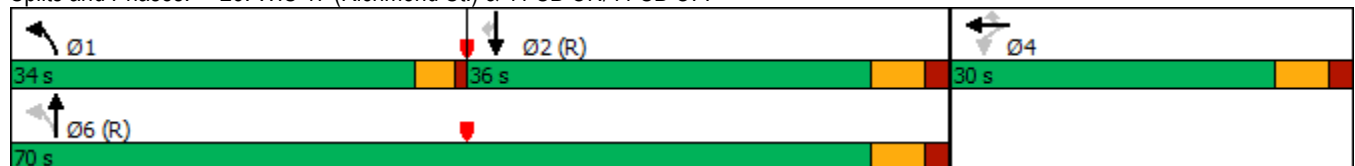
Intersection LOS: B

Intersection Capacity Utilization 67.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	280	0	240	380	450	0	0	640	460
Future Volume (veh/h)	0	0	0	280	0	240	380	450	0	0	640	460
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				322	0	0	437	517	0	0	736	0
Peak Hour Factor				0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				485	262		809	2793	0	0	1562	
Arrive On Green				0.14	0.00	0.00	0.60	1.00	0.00	0.00	0.44	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				322	0	0	437	517	0	0	736	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				8.8	0.0	0.0	7.1	0.0	0.0	0.0	14.6	0.0
Cycle Q Clear(g_c), s				8.8	0.0	0.0	7.1	0.0	0.0	0.0	14.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				485	262		809	2793	0	0	1562	
V/C Ratio(X)				0.66	0.00		0.54	0.19	0.00	0.00	0.47	
Avail Cap(c_a), veh/h				898	486		809	2793	0	0	1562	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.74	0.74	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				40.7	0.0	0.0	3.7	0.0	0.0	0.0	19.8	0.0
Incr Delay (d2), s/veh				1.6	0.0	0.0	1.9	0.1	0.0	0.0	1.0	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.8	0.0	0.0	1.7	0.0	0.0	0.0	6.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				42.3	0.0	0.0	5.6	0.1	0.0	0.0	20.8	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					322	A		954			736	A
Approach Delay, s/veh					42.3			2.6			20.8	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	48.0		18.0		82.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	9.1	16.6		10.8		2.0						
Green Ext Time (p_c), s	1.0	5.5		1.2		1.4						

Intersection Summary

HCM 6th Ctrl Delay 15.6

HCM 6th LOS B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	660	160	1030	0	0	870	550
Future Volume (vph)	0	0	0	230	0	660	160	1030	0	0	870	550
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						90						663
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	277	0	795	193	1241	0	0	1048	663
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	277	0	795	193	1241	0	0	1048	663
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				26.0		26.0	66.0	66.0			32.0	32.0
Actuated g/C Ratio				0.26		0.26	0.66	0.66			0.32	0.32
v/c Ratio				0.31		1.66	0.31	0.53			0.93	0.69
Control Delay				30.9		332.8	9.9	3.0			47.6	6.5
Queue Delay				0.0		0.0	0.0	0.4			0.0	0.0
Total Delay				30.9		332.8	9.9	3.4			47.6	6.5
LOS				C		F	A	A			D	A
Approach Delay					254.8			4.3			31.7	
Approach LOS					F			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.66

Intersection Signal Delay: 79.1

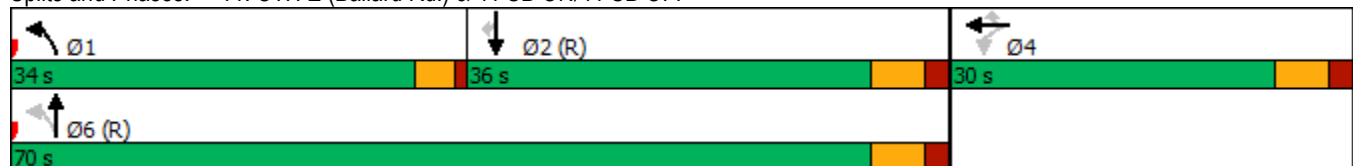
Intersection LOS: E

Intersection Capacity Utilization 88.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	230	0	660	160	1030	0	0	870	550
Future Volume (veh/h)	0	0	0	230	0	660	160	1030	0	0	870	550
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				277	0	0	193	1241	0	0	1048	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				898	486		622	2364	0	0	1137	
Arrive On Green				0.26	0.00	0.00	0.10	0.22	0.00	0.00	0.43	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				277	0	0	193	1241	0	0	1048	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.4	0.0	0.0	5.5	30.6	0.0	0.0	27.9	0.0
Cycle Q Clear(g_c), s				6.4	0.0	0.0	5.5	30.6	0.0	0.0	27.9	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				898	486		622	2364	0	0	1137	
V/C Ratio(X)				0.31	0.00		0.31	0.52	0.00	0.00	0.92	
Avail Cap(c_a), veh/h				898	486		622	2364	0	0	1137	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.63	0.63	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				29.8	0.0	0.0	17.2	25.3	0.0	0.0	27.5	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	0.8	0.5	0.0	0.0	13.5	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.8	0.0	0.0	2.3	14.7	0.0	0.0	12.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.7	0.0	0.0	18.0	25.8	0.0	0.0	41.0	0.0
LnGrp LOS				C	A		B	C	A	A	D	
Approach Vol, veh/h					277	A		1434			1048	A
Approach Delay, s/veh					30.7			24.7			41.0	
Approach LOS					C			C			D	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	36.0		30.0		70.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	7.5	29.9		8.4		32.6						
Green Ext Time (p_c), s	0.4	0.1		1.6		4.2						

Intersection Summary

HCM 6th Ctrl Delay	31.5
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	540	0	350	0	0	0	0	650	270	810	290	0
Future Volume (vph)	540	0	350	0	0	0	0	650	270	810	290	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.145		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3574	1599	273	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			596						307			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	614	0	398	0	0	0	0	739	307	920	330	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	614	0	398	0	0	0	0	739	307	920	330	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

7:00 am Baseline

Synchro 10 Report
Page 10

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	26.0	26.0	26.0					36.0	36.0	38.0	74.0	
Total Split (%)	26.0%	26.0%	26.0%					36.0%	36.0%	38.0%	74.0%	
Maximum Green (s)	20.0	20.0	20.0					30.0	30.0	34.0	68.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	24.2		24.2					29.8	29.8	67.8	67.8	
Actuated g/C Ratio	0.24		0.24					0.30	0.30	0.68	0.68	
v/c Ratio	0.74		0.48					0.69	0.44	1.32	0.14	
Control Delay	42.1		2.0					34.6	5.2	163.7	0.1	
Queue Delay	0.0		0.0					0.0	0.0	0.1	0.0	
Total Delay	42.1		2.0					34.6	5.2	163.8	0.1	
LOS	D		A					C	A	F	A	
Approach Delay		26.3						26.0			120.6	
Approach LOS		C						C			F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 10 (10%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 61.8

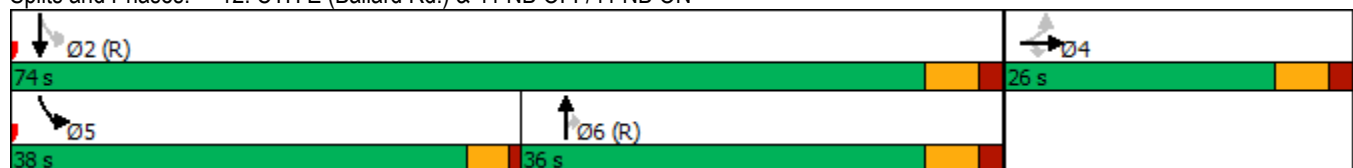
Intersection LOS: E

Intersection Capacity Utilization 88.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	540	0	350	0	0	0	0	650	270	810	290	0
Future Volume (veh/h)	540	0	350	0	0	0	0	650	270	810	290	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	614	0	0				0	739	0	920	330	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	760	411					0	1146		808	2507	0
Arrive On Green	0.22	0.00	0.00				0.00	0.64	0.00	0.57	1.00	0.00
Sat Flow, veh/h	3456	1870	1585				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	614	0	0				0	739	0	920	330	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1791	1598	1795	1791	0
Q Serve(g_s), s	16.9	0.0	0.0				0.0	12.6	0.0	34.0	0.0	0.0
Cycle Q Clear(g_c), s	16.9	0.0	0.0				0.0	12.6	0.0	34.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	760	411					0	1146		808	2507	0
V/C Ratio(X)	0.81	0.00					0.00	0.64		1.14	0.13	0.00
Avail Cap(c_a), veh/h	760	411					0	1146		808	2507	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	1.67	1.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.50	0.50	0.00
Uniform Delay (d), s/veh	37.0	0.0	0.0				0.0	14.5	0.0	11.3	0.0	0.0
Incr Delay (d2), s/veh	9.0	0.0	0.0				0.0	2.8	0.0	70.3	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.0	0.0	0.0				0.0	4.0	0.0	20.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.0	0.0	0.0				0.0	17.3	0.0	81.6	0.1	0.0
LnGrp LOS	D	A					A	B		F	A	A
Approach Vol, veh/h	614		A					739	A	1250		
Approach Delay, s/veh	46.0							17.3		60.1		
Approach LOS	D							B		E		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	74.0			26.0	38.0	36.0						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	68.0			20.0	34.0	30.0						
Max Q Clear Time (g_c+I1), s	2.0			18.9	36.0	14.6						
Green Ext Time (p_c), s	0.9			0.5	0.0	4.6						
Intersection Summary												
HCM 6th Ctrl Delay			44.6									
HCM 6th LOS			D									
Notes												

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↗	↕			↕	↗
Traffic Volume (vph)	0	0	0	120	0	70	320	270	0	0	210	270
Future Volume (vph)	0	0	0	120	0	70	320	270	0	0	210	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3505	1568
Flt Permitted					0.950		0.605					
Satd. Flow (perm)	0	0	0	0	1787	1599	1138	3574	0	0	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						104						303
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	0	0	135	0	79	360	303	0	0	236	303
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	135	79	360	303	0	0	236	303
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					12.6	12.6	37.0	37.0			22.5	22.5
Actuated g/C Ratio					0.22	0.22	0.64	0.64			0.39	0.39
v/c Ratio					0.35	0.18	0.42	0.13			0.17	0.38
Control Delay					21.8	4.3	7.7	4.3			12.1	3.5
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					21.8	4.3	7.7	4.3			12.1	3.5
LOS					C	A	A	A			B	A
Approach Delay					15.3			6.1			7.2	
Approach LOS					B			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 57.6

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 8.0

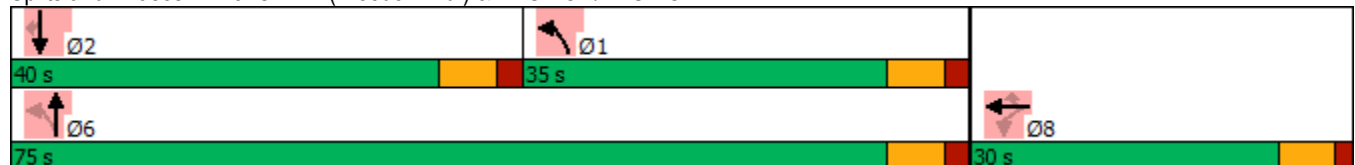
Intersection LOS: A

Intersection Capacity Utilization 52.8%

ICU Level of Service A

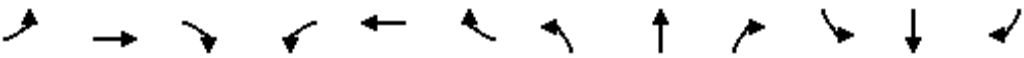
Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↰	↱	↰	↱			↱	↰
Traffic Volume (veh/h)	0	0	0	120	0	70	320	270	0	0	210	270
Future Volume (veh/h)	0	0	0	120	0	70	320	270	0	0	210	270
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1856	1856
Adj Flow Rate, veh/h				135	0	0	360	303	0	0	236	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	3	3
Cap, veh/h				347	0		790	2377	0	0	1422	
Arrive On Green				0.19	0.00	0.00	0.19	0.66	0.00	0.00	0.40	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3618	1572
Grp Volume(v), veh/h				135	0	0	360	303	0	0	236	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1763	1572
Q Serve(g_s), s				3.7	0.0	0.0	0.0	1.7	0.0	0.0	2.4	0.0
Cycle Q Clear(g_c), s				3.7	0.0	0.0	0.0	1.7	0.0	0.0	2.4	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				347	0		790	2377	0	0	1422	
V/C Ratio(X)				0.39	0.00		0.46	0.13	0.00	0.00	0.17	
Avail Cap(c_a), veh/h				837	0		1450	4560	0	0	2276	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				19.6	0.0	0.0	11.5	3.4	0.0	0.0	10.6	0.0
Incr Delay (d2), s/veh				0.7	0.0	0.0	0.6	0.0	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.5	0.0	0.0	2.9	0.4	0.0	0.0	0.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				20.3	0.0	0.0	12.0	3.5	0.0	0.0	10.7	0.0
LnGrp LOS				C	A		B	A	A	A	B	
Approach Vol, veh/h					135	A		663			236	A
Approach Delay, s/veh					20.3			8.1			10.7	
Approach LOS					C			A			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		14.8				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.0	4.4				3.7		5.7				
Green Ext Time (p_c), s	2.4	1.6				1.4		0.4				

Intersection Summary

HCM 6th Ctrl Delay	10.3
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	0	170	0	0	0	0	480	190	80	250	0
Future Volume (vph)	110	0	170	0	0	0	0	480	190	80	250	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1736	1553	0	0	0	0	3471	1553	1736	3471	0
Flt Permitted		0.950								0.423		
Satd. Flow (perm)	0	1736	1553	0	0	0	0	3471	1553	773	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			185						157			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
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 (%)	4%	4%	4%	1%	1%	1%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	120	0	185	0	0	0	0	522	207	87	272	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	120	185	0	0	0	0	522	207	87	272	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

7:00 am Baseline

Synchro 10 Report
Page 6

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 55.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

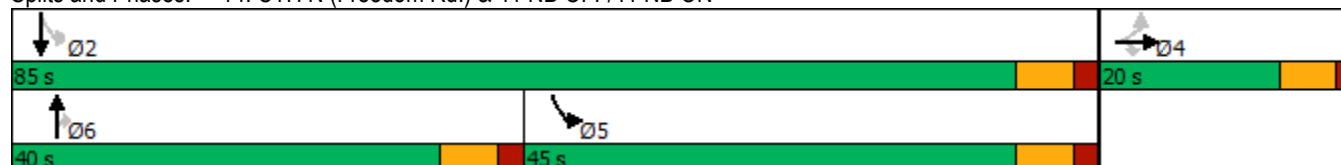
Maximum v/c Ratio: 0.36

Intersection Signal Delay: 9.7 Intersection LOS: A

Intersection Capacity Utilization 52.8%	ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	0	170	0	0	0	0	480	190	80	250	0
Future Volume (veh/h)	110	0	170	0	0	0	0	480	190	80	250	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841				0	1841	1841	1841	1841	0
Adj Flow Rate, veh/h	120	0	0				0	522	0	87	272	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4				0	4	4	4	4	0
Cap, veh/h	330	0					0	1421		653	2334	0
Arrive On Green	0.19	0.00	0.00				0.00	0.41	0.00	0.19	0.67	0.00
Sat Flow, veh/h	1753	0	1560				0	3589	1560	1753	3589	0
Grp Volume(v), veh/h	120	0	0				0	522	0	87	272	0
Grp Sat Flow(s),veh/h/ln	1753	0	1560				0	1749	1560	1753	1749	0
Q Serve(g_s), s	3.3	0.0	0.0				0.0	5.8	0.0	0.0	1.6	0.0
Cycle Q Clear(g_c), s	3.3	0.0	0.0				0.0	5.8	0.0	0.0	1.6	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	330	0					0	1421		653	2334	0
V/C Ratio(X)	0.36	0.00					0.00	0.37		0.13	0.12	0.00
Avail Cap(c_a), veh/h	506	0					0	2273		1619	5114	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.6	0.0	0.0				0.0	11.5	0.0	10.7	3.3	0.0
Incr Delay (d2), s/veh	1.0	0.0	0.0				0.0	0.2	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.0				0.0	1.9	0.0	0.6	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	0.0	0.0				0.0	11.6	0.0	10.9	3.3	0.0
LnGrp LOS	C	A					A	B		B	A	A
Approach Vol, veh/h	120		A				522		A		359	
Approach Delay, s/veh	20.6						11.6				5.2	
Approach LOS	C						B				A	
Timer - Assigned Phs	2			4		5	6					
Phs Duration (G+Y+Rc), s	41.0			14.4		14.5	26.5					
Change Period (Y+Rc), s	6.5			6.0		6.5	6.5					
Max Green Setting (Gmax), s	78.5			14.0		38.5	33.5					
Max Q Clear Time (g_c+I1), s	3.6			5.3		2.0	7.8					
Green Ext Time (p_c), s	1.3			0.3		0.5	2.5					
Intersection Summary												
HCM 6th Ctrl Delay			10.4									
HCM 6th LOS			B									
Notes												

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	100	0	70	70	100	0	0	260	60
Future Volume (vph)	0	0	0	100	0	70	70	100	0	0	260	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.945							0.850
Flt Protected					0.971		0.950					
Satd. Flow (prot)	0	0	0	0	1709	0	1787	1881	0	0	1863	1583
Flt Permitted					0.971		0.950					
Satd. Flow (perm)	0	0	0	0	1709	0	1787	1881	0	0	1863	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
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
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	118	0	82	82	118	0	0	306	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	200	0	82	118	0	0	306	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	37.4%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	4.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕		↕	↑			↑	↗
Traffic Vol, veh/h	0	0	0	100	0	70	70	100	0	0	260	60
Future Vol, veh/h	0	0	0	100	0	70	70	100	0	0	260	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	2	2	2
Mvmt Flow	0	0	0	118	0	82	82	118	0	0	306	71
Major/Minor												
Minor1				Major1				Major2				
Conflicting Flow All	624	659	118	377	0	-	-	-	-	-	0	
Stage 1	282	282	-	-	-	-	-	-	-	-	-	
Stage 2	342	377	-	-	-	-	-	-	-	-	-	
Critical Hdwy	6.42	6.52	6.22	4.11	-	-	-	-	-	-	-	
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-	-	-	
Follow-up Hdwy	3.518	4.018	3.318	2.209	-	-	-	-	-	-	-	
Pot Cap-1 Maneuver	449	384	934	1187	-	0	0	-	-	-	-	
Stage 1	766	678	-	-	-	0	0	-	-	-	-	
Stage 2	719	616	-	-	-	0	0	-	-	-	-	
Platoon blocked, %					-			-		-		
Mov Cap-1 Maneuver	418	0	934	1187	-	-	-	-	-	-	-	
Mov Cap-2 Maneuver	418	0	-	-	-	-	-	-	-	-	-	
Stage 1	713	0	-	-	-	-	-	-	-	-	-	
Stage 2	719	0	-	-	-	-	-	-	-	-	-	
Approach												
WB				NB				SB				
HCM Control Delay, s	15.5			3.4				0				
HCM LOS	C											
Minor Lane/Major Mvmt												
NBL				NBTWBLn1				SBT SBR				
Capacity (veh/h)	1187	-	541	-	-	-	-					
HCM Lane V/C Ratio	0.069	-	0.37	-	-	-	-					
HCM Control Delay (s)	8.3	-	15.5	-	-	-	-					
HCM Lane LOS	A	-	C	-	-	-	-					
HCM 95th %tile Q(veh)	0.2	-	1.7	-	-	-	-					

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	0	70	0	0	0	0	130	250	60	300	0
Future Volume (vph)	40	0	70	0	0	0	0	130	250	60	300	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.914							0.850			
Flt Protected		0.982								0.950		
Satd. Flow (prot)	0	1624	0	0	0	0	0	1863	1583	1787	1881	0
Flt Permitted		0.982								0.950		
Satd. Flow (perm)	0	1624	0	0	0	0	0	1863	1583	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	45	0	80	0	0	0	0	148	284	68	341	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	125	0	0	0	0	0	148	284	68	341	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	37.4%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection

Int Delay, s/veh 2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	0	70	0	0	0	0	130	250	60	300	0
Future Vol, veh/h	40	0	70	0	0	0	0	130	250	60	300	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	2	2	2	1	1	1
Mvmt Flow	45	0	80	0	0	0	0	148	284	68	341	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	767	909	341	-	0	0	432	0	0
Stage 1	477	477	-	-	-	-	-	-	-
Stage 2	290	432	-	-	-	-	-	-	-
Critical Hdwy	6.45	6.55	6.25	-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.45	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	-	-	-	2.209	-	-
Pot Cap-1 Maneuver	366	272	695	0	-	-	1133	-	0
Stage 1	618	551	-	0	-	-	-	-	0
Stage 2	753	577	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	344	0	695	-	-	-	1133	-	-
Mov Cap-2 Maneuver	344	0	-	-	-	-	-	-	-
Stage 1	581	0	-	-	-	-	-	-	-
Stage 2	753	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.4	0	1.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	507	1133	-
HCM Lane V/C Ratio	-	-	0.247	0.06	-
HCM Control Delay (s)	-	-	14.4	8.4	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1	0.2	-

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	350	90	150	130	0	0	0	0	60	0	120
Future Volume (vph)	0	350	90	150	130	0	0	0	0	60	0	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	412	106	176	153	0	0	0	0	71	0	141
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	412	106	176	153	0	0	0	0	0	71	141
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	41.5%											
Analysis Period (min)	15											
	ICU Level of Service A											

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↑	↗
Traffic Vol, veh/h	0	350	90	150	130	0	0	0	0	60	0	120
Future Vol, veh/h	0	350	90	150	130	0	0	0	0	60	0	120
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	412	106	176	153	0	0	0	0	71	0	141
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	518	0	0				970	1023	153
Stage 1	-	-	-	-	-	-				505	505	-
Stage 2	-	-	-	-	-	-				465	518	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1053	-	0				281	236	893
Stage 1	0	-	-	-	-	0				606	540	-
Stage 2	0	-	-	-	-	0				632	533	-
Platoon blocked, %	-	-	-	-	-	-				-	-	-
Mov Cap-1 Maneuver	-	-	-	1053	-	-				234	0	893
Mov Cap-2 Maneuver	-	-	-	-	-	-				234	0	-
Stage 1	-	-	-	-	-	-				505	0	-
Stage 2	-	-	-	-	-	-				632	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			4.9			15.5					
HCM LOS							C					
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1053	-	234	893						
HCM Lane V/C Ratio	-	-	0.168	-	0.302	0.158						
HCM Control Delay (s)	-	-	9.1	-	26.9	9.8						
HCM Lane LOS	-	-	A	-	D	A						
HCM 95th %tile Q(veh)	-	-	0.6	-	1.2	0.6						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	120	0	0	230	130	50	0	100	0	0	0
Future Volume (vph)	290	120	0	0	230	130	50	0	100	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	330	136	0	0	261	148	57	0	114	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	330	136	0	0	261	148	0	57	114	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	41.5%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	6.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	290	120	0	0	230	130	50	0	100	0	0	0
Future Vol, veh/h	290	120	0	0	230	130	50	0	100	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	330	136	0	0	261	148	57	0	114	0	0	0
Major/Minor	Major1			Major2			Minor1					
Conflicting Flow All	409	0	-	-	-	-	0	1131	1205	136		
Stage 1	-	-	-	-	-	-	-	796	796	-		
Stage 2	-	-	-	-	-	-	-	335	409	-		
Critical Hdwy	4.11	-	-	-	-	-	-	6.45	6.55	6.25		
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.45	5.55	-		
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.45	5.55	-		
Follow-up Hdwy	2.209	-	-	-	-	-	-	3.545	4.045	3.345		
Pot Cap-1 Maneuver	1155	-	0	0	-	-	-	222	181	905		
Stage 1	-	-	0	0	-	-	-	439	395	-		
Stage 2	-	-	0	0	-	-	-	718	591	-		
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-		
Mov Cap-1 Maneuver	1155	-	-	-	-	-	-	159	0	905		
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	159	0	-		
Stage 1	-	-	-	-	-	-	-	313	0	-		
Stage 2	-	-	-	-	-	-	-	718	0	-		
Approach	EB			WB			NB					
HCM Control Delay, s	6.6			0			19.6					
HCM LOS							C					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR						
Capacity (veh/h)	159	905	1155	-	-	-						
HCM Lane V/C Ratio	0.357	0.126	0.285	-	-	-						
HCM Control Delay (s)	39.7	9.5	9.4	-	-	-						
HCM Lane LOS	E	A	A	-	-	-						
HCM 95th %tile Q(veh)	1.5	0.4	1.2	-	-	-						

APPENDIX O2

Year 2028 No Build Synchro PM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	830	410	330	380	0	0	0	0	180	0	310
Future Volume (vph)	0	830	410	330	380	0	0	0	0	180	0	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1827	1553	1719	1810	0	0	0	0	0	1787	1599
Flt Permitted				0.105							0.950	
Satd. Flow (perm)	0	1827	1553	190	1810	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			296									333
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1000	494	398	458	0	0	0	0	217	0	373
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1000	494	398	458	0	0	0	0	0	217	373
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		38.0	38.0	16.0	54.0					46.0	46.0	46.0
Total Split (%)		38.0%	38.0%	16.0%	54.0%					46.0%	46.0%	46.0%
Maximum Green (s)		31.5	31.5	9.5	47.5					40.0	40.0	40.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		34.1	34.1	50.1	50.1						16.8	16.8
Actuated g/C Ratio		0.45	0.45	0.67	0.67						0.22	0.22
v/c Ratio		1.20	0.57	1.07	0.38						0.54	0.60
Control Delay		126.7	9.2	95.1	7.3						30.8	9.0
Queue Delay		0.0	0.0	0.0	0.5						0.0	0.0
Total Delay		126.7	9.2	95.1	7.8						30.8	9.0
LOS		F	A	F	A						C	A
Approach Delay		87.8			48.4						17.0	
Approach LOS		F			D						B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 75

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.20

Intersection Signal Delay: 62.1

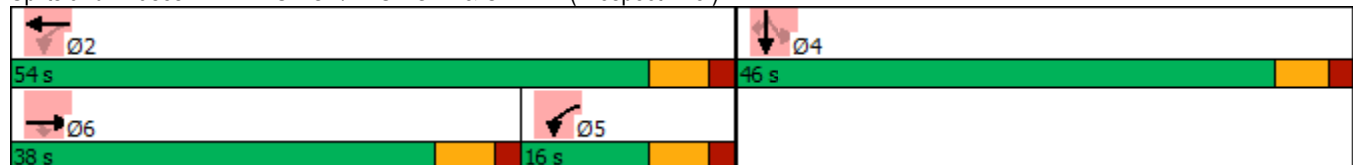
Intersection LOS: E

Intersection Capacity Utilization 81.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

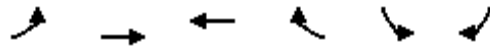
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	830	410	330	380	0	0	0	0	180	0	310
Future Volume (veh/h)	0	830	410	330	380	0	0	0	0	180	0	310
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1826	1826	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1000	494	398	458	0				217	0	373
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	4	4	5	5	0				1	1	1
Cap, veh/h	0	760	644	341	1109	0				530	0	472
Arrive On Green	0.00	0.41	0.41	0.15	0.61	0.00				0.30	0.00	0.30
Sat Flow, veh/h	0	1841	1560	1739	1826	0				1795	0	1598
Grp Volume(v), veh/h	0	1000	494	398	458	0				217	0	373
Grp Sat Flow(s),veh/h/ln	0	1841	1560	1739	1826	0				1795	0	1598
Q Serve(g_s), s	0.0	34.0	22.4	12.0	10.8	0.0				8.0	0.0	17.7
Cycle Q Clear(g_c), s	0.0	34.0	22.4	12.0	10.8	0.0				8.0	0.0	17.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	760	644	341	1109	0				530	0	472
V/C Ratio(X)	0.00	1.32	0.77	1.17	0.41	0.00				0.41	0.00	0.79
Avail Cap(c_a), veh/h	0	760	644	341	1109	0				916	0	815
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	24.1	20.7	33.6	8.5	0.0				23.2	0.0	26.7
Incr Delay (d2), s/veh	0.0	151.0	5.9	102.3	0.4	0.0				0.5	0.0	3.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	45.5	8.7	16.3	3.8	0.0				3.3	0.0	14.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	175.2	26.6	135.9	8.8	0.0				23.8	0.0	29.7
LnGrp LOS	A	F	C	F	A	A				C	A	C
Approach Vol, veh/h		1494			856						590	
Approach Delay, s/veh		126.1			67.9						27.5	
Approach LOS		F			E						C	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		54.0		28.3	16.0	38.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		47.5		40.0	9.5	31.5						
Max Q Clear Time (g_c+I1), s		12.8		19.7	14.0	36.0						
Green Ext Time (p_c), s		3.3		2.6	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			89.3									
HCM 6th LOS			F									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	630	380	710	160	0	0
Future Volume (vph)	630	380	710	160	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1845	1568	0	0
Flt Permitted	0.168					
Satd. Flow (perm)	313	1863	1845	1568	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				165		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	3%	3%	1%	1%
Adj. Flow (vph)	649	392	732	165	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	649	392	732	165	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0		
Minimum Split (s)	13.5	26.5	26.5	26.5		

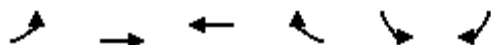
5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	53.2	57.3	26.4	26.4		
Actuated g/C Ratio	0.93	1.00	0.46	0.46		
v/c Ratio	0.75	0.21	0.86	0.20		
Control Delay	14.2	0.3	30.0	3.4		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	14.2	0.3	30.0	3.4		
LOS	B	A	C	A		
Approach Delay		9.0	25.1			
Approach LOS		A	C			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 57.3

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 16.4

Intersection LOS: B

Intersection Capacity Utilization 81.9%

ICU Level of Service D

Analysis Period (min) 15

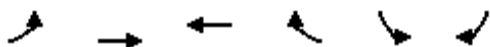
Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	630	380	710	160	0	0
Future Volume (veh/h)	630	380	710	160	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856		
Adj Flow Rate, veh/h	649	392	732	165		
Peak Hour Factor	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	3	3		
Cap, veh/h	819	1721	887	751		
Arrive On Green	0.36	0.92	0.48	0.48		
Sat Flow, veh/h	1781	1870	1856	1572		
Grp Volume(v), veh/h	649	392	732	165		
Grp Sat Flow(s),veh/h/ln	1781	1870	1856	1572		
Q Serve(g_s), s	10.6	1.1	17.0	3.1		
Cycle Q Clear(g_c), s	10.6	1.1	17.0	3.1		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	819	1721	887	751		
V/C Ratio(X)	0.79	0.23	0.83	0.22		
Avail Cap(c_a), veh/h	1383	3585	963	816		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	12.1	0.2	11.3	7.6		
Incr Delay (d2), s/veh	1.8	0.1	6.0	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.1	0.0	6.8	0.8		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.9	0.3	17.2	7.8		
LnGrp LOS	B	A	B	A		
Approach Vol, veh/h		1041	897			
Approach Delay, s/veh		8.8	15.5			
Approach LOS		A	B			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	22.2	27.9			50.1	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	12.6	19.0			3.1	
Green Ext Time (p_c), s	3.0	2.4			2.8	
Intersection Summary						
HCM 6th Ctrl Delay			11.9			
HCM 6th LOS			B			

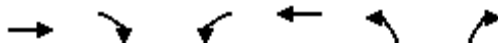
Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	380	0	0	670	200	400
Future Volume (vph)	380	0	0	670	200	400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1845	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1845	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						382
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Adj. Flow (vph)	447	0	0	788	235	471
Shared Lane Traffic (%)						
Lane Group Flow (vph)	447	0	0	788	235	471
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Act Effect Green (s)	35.6			35.6	18.3	18.3
Actuated g/C Ratio	0.57			0.57	0.29	0.29
v/c Ratio	0.42			0.75	0.45	0.64
Control Delay	9.3			15.9	23.6	9.7
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.3			15.9	23.6	9.7
LOS	A			B	C	A
Approach Delay	9.3			15.9	14.3	
Approach LOS	A			B	B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 62.5

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 13.8

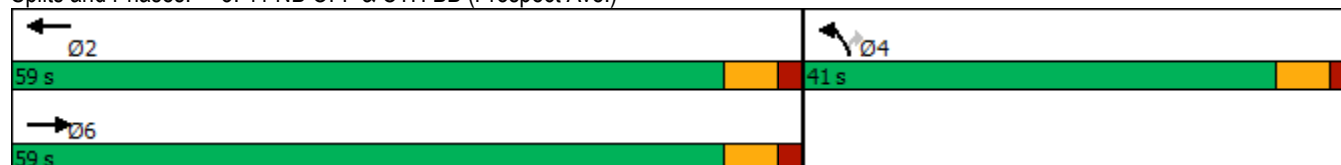
Intersection LOS: B

Intersection Capacity Utilization 53.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary 3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	380	0	0	670	200	400
Future Volume (veh/h)	380	0	0	670	200	400
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1856	1870	1870
Adj Flow Rate, veh/h	447	0	0	788	235	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	0	3	2	2
Cap, veh/h	1060	0	0	1052	454	
Arrive On Green	0.57	0.00	0.00	0.57	0.26	0.00
Sat Flow, veh/h	1870	0	0	1856	1781	1585
Grp Volume(v), veh/h	447	0	0	788	235	0
Grp Sat Flow(s),veh/h/ln	1870	0	0	1856	1781	1585
Q Serve(g_s), s	6.1	0.0	0.0	14.4	5.1	0.0
Cycle Q Clear(g_c), s	6.1	0.0	0.0	14.4	5.1	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1060	0	0	1052	454	
V/C Ratio(X)	0.42	0.00	0.00	0.75	0.52	
Avail Cap(c_a), veh/h	2288	0	0	2270	1466	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.5	0.0	0.0	7.3	14.4	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.6	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	0.0	3.9	1.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.9	0.0	0.0	8.9	15.3	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	447			788	235	A
Approach Delay, s/veh	5.9			8.9	15.3	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	29.5		15.5		29.5	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	16.4		7.1		8.1	
Green Ext Time (p_c), s	7.1		0.9		3.2	
Intersection Summary						
HCM 6th Ctrl Delay			9.0			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	1380	600	440	1450	0	0	0	0	190	0	210
Future Volume (vph)	0	1380	600	440	1450	0	0	0	0	190	0	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0		0	450		450
Storage Lanes	0		1	1		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			497									121
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	1438	625	458	1510	0	0	0	0	198	0	219
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	1438	625	458	1510	0	0	0	0	0	198	219
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	4.0	5.0					5.0	5.0	5.0
Minimum Split (s)		9.0	9.0	10.0	10.0					11.0	11.0	11.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	72.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	1.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-1.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.88	0.74	0.69	0.58					0.63	0.35	0.35
Control Delay		40.1	12.5	42.0	11.5					47.1	17.7	17.7
Queue Delay		0.0	0.0	0.0	0.1					0.0	0.0	0.0
Total Delay		40.1	12.5	42.0	11.6					47.1	17.7	17.7
LOS		D	B	D	B					D	B	B
Approach Delay		31.7			18.7					31.6		
Approach LOS		C			B					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 25.9

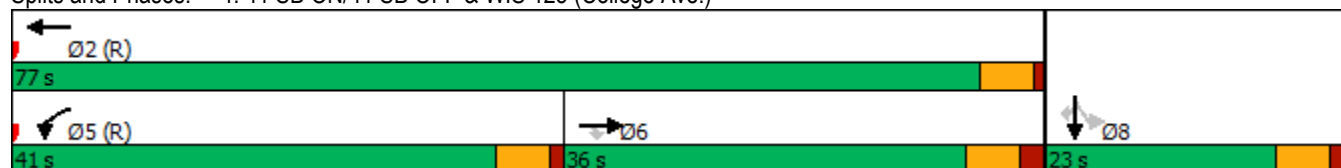
Intersection LOS: C

Intersection Capacity Utilization 81.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	1380	600	440	1450	0	0	0	0	190	0	210
Future Volume (veh/h)	0	1380	600	440	1450	0	0	0	0	190	0	210
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1856	1856	1856
Adj Flow Rate, veh/h	0	1438	0	458	1510	0				198	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	1	1	0				3	3	3
Cap, veh/h	0	2496		971	3797	0				672	0	
Arrive On Green	0.00	0.16	0.00	0.54	1.00	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1795	3676	0				3534	0	3145
Grp Volume(v), veh/h	0	1438	0	458	1510	0				198	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1795	1791	0				1767	0	1572
Q Serve(g_s), s	0.0	26.0	0.0	15.7	0.0	0.0				4.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	26.0	0.0	15.7	0.0	0.0				4.8	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2496		971	3797	0				672	0	
V/C Ratio(X)	0.00	0.58		0.47	0.40	0.00				0.29	0.00	
Avail Cap(c_a), veh/h	0	2496		971	3797	0				672	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	32.3	0.0	14.1	0.0	0.0				34.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.0	0.0	0.0				1.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	12.1	0.0	6.1	0.0	0.0				2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	33.3	0.0	14.2	0.0	0.0				35.9	0.0	0.0
LnGrp LOS	A	C		B	A	A				D	A	
Approach Vol, veh/h		1438	A		1968						198	A
Approach Delay, s/veh		33.3			3.3						35.9	
Approach LOS		C			A						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		112.0			58.9	53.1		23.0				
Change Period (Y+Rc), s		* 6			5.0	6.0		6.0				
Max Green Setting (Gmax), s		* 72			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		2.0			17.7	28.0		6.8				
Green Ext Time (p_c), s		11.6			1.9	1.4		0.6				
Intersection Summary												
HCM 6th Ctrl Delay			17.1									
HCM 6th LOS			B									
Notes												
User approved volume balancing among the lanes for turning movement.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	1010	0	0	1380	290	510	0	490	0	0	0
Future Volume (vph)	560	1010	0	0	1380	290	510	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.125						0.950					
Satd. Flow (perm)	235	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						299			216			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	577	1041	0	0	1423	299	526	0	505	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	577	1041	0	0	1423	299	526	0	505	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	67.0			32.0	32.0	33.0	33.0	33.0			
Total Split (%)	35.0%	67.0%			32.0%	32.0%	33.0%	33.0%	33.0%			
Maximum Green (s)	29.0	61.0			26.0	26.0	28.0	28.0	28.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	63.0	63.0			28.0	28.0	29.0		29.0			
Actuated g/C Ratio	0.63	0.63			0.28	0.28	0.29		0.29			
v/c Ratio	0.92	0.46			1.00	0.45	1.08		0.53			
Control Delay	53.4	26.7			60.6	5.8	99.5		18.7			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	53.4	26.7			60.6	5.8	99.5		18.7			
LOS	D	C			E	A	F		B			
Approach Delay	36.2				51.1		59.9					
Approach LOS	D				D		E					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 47.6

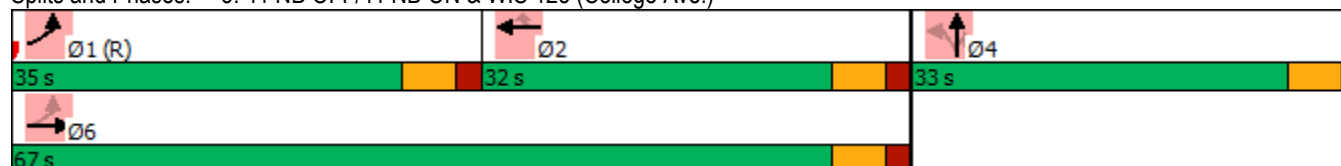
Intersection LOS: D

Intersection Capacity Utilization 81.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	560	1010	0	0	1380	290	510	0	490	0	0	0
Future Volume (veh/h)	560	1010	0	0	1380	290	510	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	577	1041	0	0	1423	0	526	0	0			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	627	2257	0	0	1438		1033	0				
Arrive On Green	0.31	0.63	0.00	0.00	0.09	0.00	0.29	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	577	1041	0	0	1423	0	526	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	26.7	15.2	0.0	0.0	27.8	0.0	12.3	0.0	0.0			
Cycle Q Clear(g_c), s	26.7	15.2	0.0	0.0	27.8	0.0	12.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	627	2257	0	0	1438		1033	0				
V/C Ratio(X)	0.92	0.46	0.00	0.00	0.99		0.51	0.00				
Avail Cap(c_a), veh/h	630	2257	0	0	1438		1033	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.35	0.35	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	26.5	9.6	0.0	0.0	45.2	0.0	29.6	0.0	0.0			
Incr Delay (d2), s/veh	8.2	0.2	0.0	0.0	21.3	0.0	1.8	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	14.4	5.5	0.0	0.0	15.5	0.0	5.4	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.8	9.9	0.0	0.0	66.5	0.0	31.4	0.0	0.0			
LnGrp LOS	C	A	A	A	E		C	A				
Approach Vol, veh/h	1618			1423			526			A		
Approach Delay, s/veh	18.8			66.5			31.4					
Approach LOS	B			E			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.8	32.2		33.0		67.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	26.0		28.0		61.0						
Max Q Clear Time (g_c+I1), s	28.7	29.8		14.3		17.2						
Green Ext Time (p_c), s	0.1	0.0		2.2		6.2						

Intersection Summary

HCM 6th Ctrl Delay 39.7

HCM 6th LOS D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	1580	420	600	1620	0	0	0	0	220	0	500
Future Volume (vph)	0	1580	420	600	1620	0	0	0	0	220	0	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1787	1599
Flt Permitted				0.125							0.950	
Satd. Flow (perm)	0	5085	1583	233	3539	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			429									76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1612	429	612	1653	0	0	0	0	224	0	510
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1612	429	612	1653	0	0	0	0	0	224	510
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	70.0	70.0						22.0	22.0
Actuated g/C Ratio		0.30	0.30	0.70	0.70						0.22	0.22
v/c Ratio		1.06	0.55	0.85	0.67						0.57	1.24
Control Delay		74.5	5.7	7.5	4.8						41.4	157.9
Queue Delay		17.8	0.0	50.0	48.8						0.0	0.0
Total Delay		92.4	5.7	57.5	53.6						41.4	157.9
LOS		F	A	E	D						D	F
Approach Delay		74.2			54.7						122.3	
Approach LOS		E			D						F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 72.4

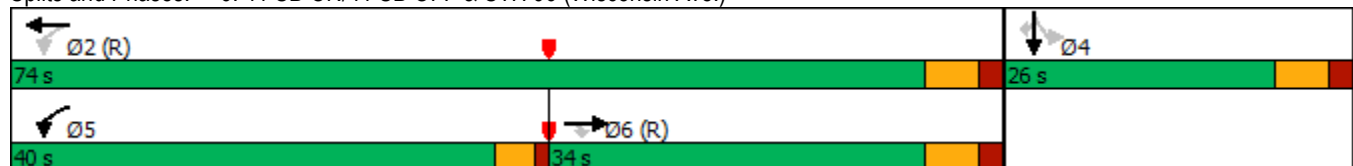
Intersection LOS: E

Intersection Capacity Utilization 96.9%

ICU Level of Service F

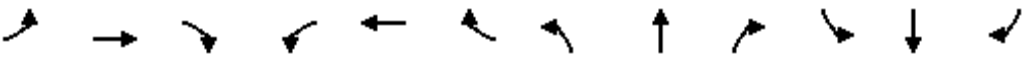
Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (veh/h)	0	1580	420	600	1620	0	0	0	0	220	0	500
Future Volume (veh/h)	0	1580	420	600	1620	0	0	0	0	220	0	500
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1612	0	612	1653	0				224	0	510
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1532		713	2488	0				395	0	351
Arrive On Green	0.00	0.30	0.00	0.36	0.70	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1795	0	1598
Grp Volume(v), veh/h	0	1612	0	612	1653	0				224	0	510
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1795	0	1598
Q Serve(g_s), s	0.0	30.0	0.0	27.3	26.1	0.0				11.1	0.0	22.0
Cycle Q Clear(g_c), s	0.0	30.0	0.0	27.3	26.1	0.0				11.1	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		713	2488	0				395	0	351
V/C Ratio(X)	0.00	1.05		0.86	0.66	0.00				0.57	0.00	1.45
Avail Cap(c_a), veh/h	0	1532		713	2488	0				395	0	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	35.0	0.0	23.6	8.4	0.0				34.8	0.0	39.0
Incr Delay (d2), s/veh	0.0	38.1	0.0	1.3	0.1	0.0				1.9	0.0	218.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	17.5	0.0	13.1	8.4	0.0				5.0	0.0	38.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	73.1	0.0	25.0	8.5	0.0				36.7	0.0	257.3
LnGrp LOS	A	F		C	A	A				D	A	F
Approach Vol, veh/h		1612	A		2265						734	
Approach Delay, s/veh		73.1			13.0						190.0	
Approach LOS		E			B						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		28.1		24.0	29.3	32.0						
Green Ext Time (p_c), s		19.8		0.0	1.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			62.2									
HCM 6th LOS			E									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	730	1070	0	0	1800	310	420	0	490	0	0	0
Future Volume (vph)	730	1070	0	0	1800	310	420	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.125						0.950					
Satd. Flow (perm)	233	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						316			140			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	745	1092	0	0	1837	316	429	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	745	1092	0	0	1837	316	429	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	1.04	0.44			1.20	0.45	1.16		1.09			
Control Delay	38.7	2.3			131.1	5.4	135.6		98.2			
Queue Delay	24.0	7.2			0.5	0.0	0.0		0.0			
Total Delay	62.6	9.5			131.6	5.4	135.6		98.2			
LOS	E	A			F	A	F		F			
Approach Delay	31.0				113.1		115.4					
Approach LOS	C				F		F					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.20

Intersection Signal Delay: 82.9

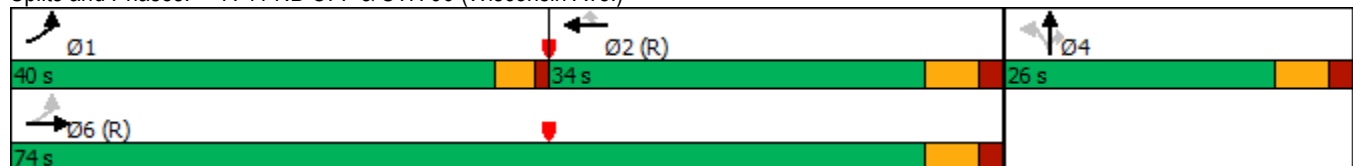
Intersection LOS: F

Intersection Capacity Utilization 96.9%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	730	1070	0	0	1800	310	420	0	490	0	0	0
Future Volume (veh/h)	730	1070	0	0	1800	310	420	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No				No				No			
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	745	1092	0	0	1837	316	429	0	0			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	713	2681	0	0	1810	562	590	0				
Arrive On Green	0.12	0.25	0.00	0.00	0.35	0.35	0.17	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	745	1092	0	0	1837	316	429	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	36.0	25.7	0.0	0.0	35.4	16.1	11.4	0.0	0.0			
Cycle Q Clear(g_c), s	36.0	25.7	0.0	0.0	35.4	16.1	11.4	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	713	2681	0	0	1810	562	590	0				
V/C Ratio(X)	1.04	0.41	0.00	0.00	1.02	0.56	0.73	0.00				
Avail Cap(c_a), veh/h	713	2681	0	0	1810	562	784	0				
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	39.4	18.9	0.0	0.0	32.3	26.0	39.6	0.0	0.0			
Incr Delay (d2), s/veh	24.4	0.0	0.0	0.0	25.0	4.0	2.3	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	23.9	12.1	0.0	0.0	18.2	6.6	5.1	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.8	18.9	0.0	0.0	57.3	30.1	41.9	0.0	0.0			
LnGrp LOS	F	B	A	A	F	C	D	A				
Approach Vol, veh/h	1837				2153				429			
Approach Delay, s/veh	37.1				53.3				41.9			
Approach LOS	D				D				D			
Timer - Assigned Phs	1	2	4				6					
Phs Duration (G+Y+Rc), s	40.0	39.4	20.6				79.4					
Change Period (Y+Rc), s	4.0	6.0	6.0				6.0					
Max Green Setting (Gmax), s	36.0	28.0	20.0				68.0					
Max Q Clear Time (g_c+I1), s	38.0	37.4	13.4				27.7					
Green Ext Time (p_c), s	0.0	0.0	1.1				10.5					

Intersection Summary

HCM 6th Ctrl Delay	45.4
HCM 6th LOS	D

Notes

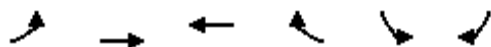
User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



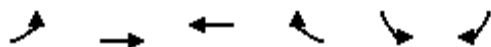
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	230	1700	1170	480	160	890
Future Volume (vph)	230	1700	1170	480	160	890
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3574	1599	1752	1568
Flt Permitted	0.080				0.950	
Satd. Flow (perm)	149	3539	3574	1599	1752	1568
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				545		189
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	261	1932	1330	545	182	1011
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	1932	1330	545	182	1011
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	13.0	64.0	51.0	51.0	31.0	31.0
Total Split (%)	13.7%	67.4%	53.7%	53.7%	32.6%	32.6%
Maximum Green (s)	8.0	58.0	45.0	45.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	59.7	59.7	46.7	46.7	27.3	27.3
Actuated g/C Ratio	0.63	0.63	0.49	0.49	0.29	0.29
v/c Ratio	1.06	0.87	0.76	0.51	0.36	1.73
Control Delay	98.3	19.9	13.3	6.4	29.6	358.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.3	19.9	13.3	6.4	29.6	358.7
LOS	F	B	B	A	C	F
Approach Delay	29.2		11.3		308.5	
Approach LOS	C		B		F	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.73

Intersection Signal Delay: 86.2

Intersection LOS: F

Intersection Capacity Utilization 94.1%

ICU Level of Service F

Analysis Period (min) 15

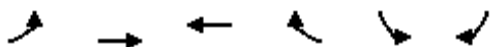
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	230	1700	1170	480	160	890
Future Volume (veh/h)	230	1700	1170	480	160	890
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	261	1932	1330	0	182	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	348	2731	2300		260	
Arrive On Green	0.11	1.00	0.21	0.00	0.15	0.00
Sat Flow, veh/h	1781	3647	3676	1598	1767	1572
Grp Volume(v), veh/h	261	1932	1330	0	182	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1767	1572
Q Serve(g_s), s	4.4	0.0	31.7	0.0	9.3	0.0
Cycle Q Clear(g_c), s	4.4	0.0	31.7	0.0	9.3	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	348	2731	2300		260	
V/C Ratio(X)	0.75	0.71	0.58		0.70	
Avail Cap(c_a), veh/h	367	2731	2300		502	
HCM Platoon Ratio	1.33	1.33	0.33	0.33	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	0.00
Uniform Delay (d), s/veh	16.7	0.0	25.9	0.0	38.5	0.0
Incr Delay (d2), s/veh	7.9	1.6	0.1	0.0	4.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.6	15.1	0.0	4.3	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.6	1.6	26.0	0.0	43.3	0.0
LnGrp LOS	C	A	C		D	
Approach Vol, veh/h		2193	1330	A	182	A
Approach Delay, s/veh		4.3	26.0		43.3	
Approach LOS		A	C		D	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	12.0	65.0		18.0		77.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	8.0	45.0		25.0		58.0
Max Q Clear Time (g_c+I1), s	6.4	33.7		11.3		2.0
Green Ext Time (p_c), s	0.2	5.5		0.8		30.1

Intersection Summary

HCM 6th Ctrl Delay	14.0
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	890	970	0	0	1350	300	300	0	800	0	0	0
Future Volume (vph)	890	970	0	0	1350	300	300	0	800	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1780	3574	0	0	3574	1599	0	1752	1568	0	0	0
Flt Permitted	0.125							0.950				
Satd. Flow (perm)	234	3574	0	0	3574	1599	0	1752	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						326			431			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
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
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	967	1054	0	0	1467	326	326	0	870	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	967	1054	0	0	1467	326	0	326	870	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Free			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	31.0	64.0			33.0	33.0	31.0	31.0				
Total Split (%)	32.6%	67.4%			34.7%	34.7%	32.6%	32.6%				
Maximum Green (s)	26.0	58.0			27.0	27.0	25.0	25.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	63.0	63.0			29.0	29.0		24.0	95.0			
Actuated g/C Ratio	0.66	0.66			0.31	0.31		0.25	1.00			
v/c Ratio	1.50	0.44			1.34	0.46		0.74	0.55			
Control Delay	252.6	2.8			190.9	5.2		42.9	1.4			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	252.6	2.8			190.9	5.2		42.9	1.4			
LOS	F	A			F	A		D	A			
Approach Delay	122.3				157.2		12.7					
Approach LOS	F				F		B					

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 54 (57%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.50

Intersection Signal Delay: 108.6

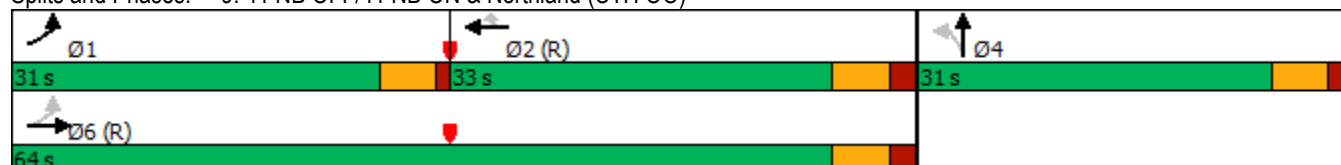
Intersection LOS: F

Intersection Capacity Utilization 113.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	890	970	0	0	1350	300	300	0	800	0	0	0
Future Volume (veh/h)	890	970	0	0	1350	300	300	0	800	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856			
Adj Flow Rate, veh/h	967	1054	0	0	1467	0	326	0	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3			
Cap, veh/h	586	2465	0	0	1296		402	0				
Arrive On Green	0.57	1.00	0.00	0.00	0.12	0.00	0.23	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3676	1598	1767	0	1572			
Grp Volume(v), veh/h	967	1054	0	0	1467	0	326	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1791	1598	1767	0	1572			
Q Serve(g_s), s	27.0	0.0	0.0	0.0	34.4	0.0	16.6	0.0	0.0			
Cycle Q Clear(g_c), s	27.0	0.0	0.0	0.0	34.4	0.0	16.6	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	586	2465	0	0	1296		402	0				
V/C Ratio(X)	1.65	0.43	0.00	0.00	1.13		0.81	0.00				
Avail Cap(c_a), veh/h	586	2465	0	0	1296		502	0				
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.46	0.46	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	14.5	0.0	0.0	0.0	41.8	0.0	34.7	0.0	0.0			
Incr Delay (d2), s/veh	296.0	0.3	0.0	0.0	69.6	0.0	8.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	54.7	0.1	0.0	0.0	28.9	0.0	8.0	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	310.6	0.3	0.0	0.0	111.4	0.0	43.6	0.0	0.0			
LnGrp LOS	F	A	A	A	F		D	A				
Approach Vol, veh/h	2021			1467			A			326		
Approach Delay, s/veh	148.7			111.4			43.6					
Approach LOS	F			F			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	38.4		25.6		69.4						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	26.0	27.0		25.0		58.0						
Max Q Clear Time (g_c+I1), s	29.0	36.4		18.6		2.0						
Green Ext Time (p_c), s	0.0	0.0		1.0		6.4						

Intersection Summary

HCM 6th Ctrl Delay 125.4

HCM 6th LOS F

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr't						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	480	0	260	0	0	0	0	920	510	300	1060	0
Future Volume (vph)	480	0	260	0	0	0	0	920	510	300	1060	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.143		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3539	1583	269	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			111						548			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	516	0	280	0	0	0	0	989	548	323	1140	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	516	0	280	0	0	0	0	989	548	323	1140	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effct Green (s)	22.6		22.6					26.0	26.0	69.4	69.4	
Actuated g/C Ratio	0.23		0.23					0.26	0.26	0.69	0.69	
v/c Ratio	0.67		0.63					1.07	0.67	0.41	0.46	
Control Delay	39.4		27.0					88.3	7.3	10.5	0.4	
Queue Delay	0.2		0.0					0.0	0.0	0.0	0.2	
Total Delay	39.6		27.0					88.3	7.3	10.5	0.6	
LOS	D		C					F	A	B	A	
Approach Delay		35.2						59.5			2.8	
Approach LOS		D						E			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 32.5

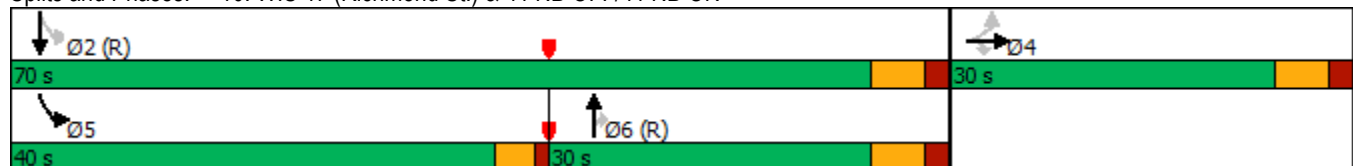
Intersection LOS: C

Intersection Capacity Utilization 71.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	480	0	260	0	0	0	0	920	510	300	1060	0
Future Volume (veh/h)	480	0	260	0	0	0	0	920	510	300	1060	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	516	0	0				0	989	0	323	1140	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2				0	2	2	1	1	0
Cap, veh/h	680	368					0	1148		743	2590	0
Arrive On Green	0.20	0.00	0.00				0.00	0.32	0.00	0.24	0.48	0.00
Sat Flow, veh/h	3456	1870	1585				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	516	0	0				0	989	0	323	1140	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1777	1585	1795	1791	0
Q Serve(g_s), s	14.1	0.0	0.0				0.0	26.1	0.0	9.4	20.9	0.0
Cycle Q Clear(g_c), s	14.1	0.0	0.0				0.0	26.1	0.0	9.4	20.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	680	368					0	1148		743	2590	0
V/C Ratio(X)	0.76	0.00					0.00	0.86		0.44	0.44	0.00
Avail Cap(c_a), veh/h	898	486					0	1148		743	2590	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.54	0.54	0.00
Uniform Delay (d), s/veh	37.9	0.0	0.0				0.0	31.7	0.0	16.9	12.5	0.0
Incr Delay (d2), s/veh	2.7	0.0	0.0				0.0	8.6	0.0	1.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.1	0.0	0.0				0.0	12.3	0.0	4.1	9.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.6	0.0	0.0				0.0	40.3	0.0	17.9	12.8	0.0
LnGrp LOS	D	A					A	D		B	B	A
Approach Vol, veh/h	516		A					989	A	1463		
Approach Delay, s/veh	40.6							40.3		13.9		
Approach LOS	D							D		B		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	76.3			23.7	40.0	36.3						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	64.0			24.0	36.0	24.0						
Max Q Clear Time (g_c+I1), s	22.9			16.1	11.4	28.1						
Green Ext Time (p_c), s	3.8			1.6	0.7	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			27.4									
HCM 6th LOS			C									

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	520	0	290	230	1170	0	0	840	310
Future Volume (vph)	0	0	0	520	0	290	230	1170	0	0	840	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						82						341
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	571	0	319	253	1286	0	0	923	341
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	571	0	319	253	1286	0	0	923	341
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				23.6		23.6	68.4	68.4			32.0	32.0
Actuated g/C Ratio				0.24		0.24	0.68	0.68			0.32	0.32
v/c Ratio				0.70		0.73	0.38	0.53			0.82	0.46
Control Delay				39.9		36.2	3.2	4.3			38.3	5.1
Queue Delay				0.0		0.0	0.0	0.9			0.0	0.0
Total Delay				39.9		36.2	3.2	5.2			38.3	5.1
LOS				D		D	A	A			D	A
Approach Delay					38.5			4.9			29.3	
Approach LOS					D			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 21.4

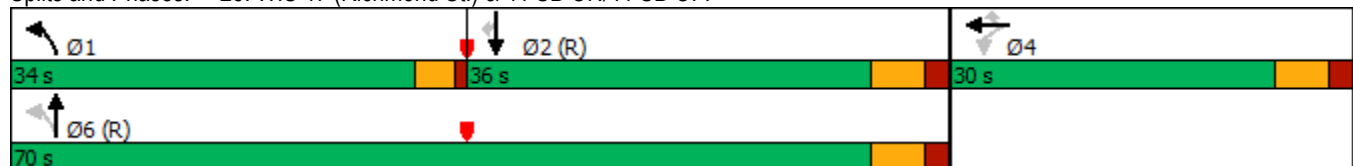
Intersection LOS: C

Intersection Capacity Utilization 71.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↑	↱	↰	↑↑			↑↑	↱
Traffic Volume (veh/h)	0	0	0	520	0	290	230	1170	0	0	840	310
Future Volume (veh/h)	0	0	0	520	0	290	230	1170	0	0	840	310
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				571	0	0	253	1286	0	0	923	0
Peak Hour Factor				0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				731	396		688	2537	0	0	1309	
Arrive On Green				0.21	0.00	0.00	0.40	0.94	0.00	0.00	0.37	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				571	0	0	253	1286	0	0	923	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				15.6	0.0	0.0	4.9	4.0	0.0	0.0	22.2	0.0
Cycle Q Clear(g_c), s				15.6	0.0	0.0	4.9	4.0	0.0	0.0	22.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				731	396		688	2537	0	0	1309	
V/C Ratio(X)				0.78	0.00		0.37	0.51	0.00	0.00	0.71	
Avail Cap(c_a), veh/h				898	486		688	2537	0	0	1309	
HCM Platoon Ratio				1.00	1.00	1.00	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.24	0.24	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				37.2	0.0	0.0	9.3	1.0	0.0	0.0	26.9	0.0
Incr Delay (d2), s/veh				3.6	0.0	0.0	0.4	0.2	0.0	0.0	3.2	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				6.9	0.0	0.0	1.6	0.8	0.0	0.0	9.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				40.9	0.0	0.0	9.7	1.1	0.0	0.0	30.2	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					571	A		1539			923	A
Approach Delay, s/veh					40.9			2.5			30.2	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	40.8		25.2		74.8						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	6.9	24.2		17.6		6.0						
Green Ext Time (p_c), s	0.5	3.6		1.6		4.5						

Intersection Summary

HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

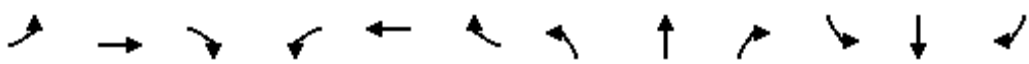
Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	510	450	1110	0	0	1140	660
Future Volume (vph)	0	0	0	230	0	510	450	1110	0	0	1140	660
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3467	1881	1599	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.098					
Satd. Flow (perm)	0	0	0	3467	1881	1599	184	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						103						539
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	258	0	573	506	1247	0	0	1281	742
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	258	0	573	506	1247	0	0	1281	742
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				26.0	26.0	26.0	31.0	74.0			43.0	43.0
Total Split (%)				26.0%	26.0%	26.0%	31.0%	74.0%			43.0%	43.0%
Maximum Green (s)				20.0	20.0	20.0	27.0	68.0			37.0	37.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				22.0		22.0	70.0	70.0			39.0	39.0
Actuated g/C Ratio				0.22		0.22	0.70	0.70			0.39	0.39
v/c Ratio				0.34		1.33	0.90	0.50			0.93	0.78
Control Delay				34.4		190.3	23.9	7.0			42.1	13.9
Queue Delay				0.0		0.0	0.0	1.2			0.8	0.0
Total Delay				34.4		190.3	23.9	8.2			42.9	13.9
LOS				C		F	C	A			D	B
Approach Delay					141.9			12.7			32.3	
Approach LOS					F			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 69 (69%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.33

Intersection Signal Delay: 44.6

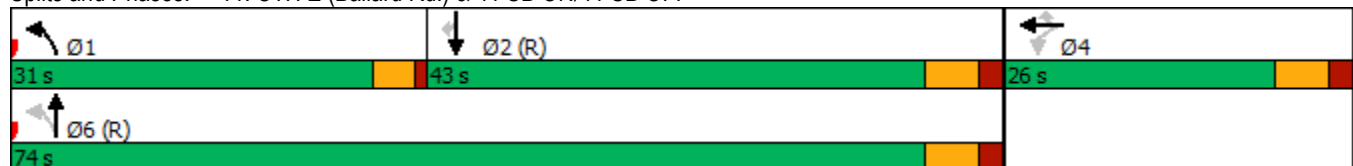
Intersection LOS: D

Intersection Capacity Utilization 85.6%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↗	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	230	0	510	450	1110	0	0	1140	660
Future Volume (veh/h)	0	0	0	230	0	510	450	1110	0	0	1140	660
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				258	0	0	506	1247	0	0	1281	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				766	415		573	2507	0	0	1386	
Arrive On Green				0.22	0.00	0.00	0.18	0.47	0.00	0.00	0.52	0.00
Sat Flow, veh/h				3483	1885	1598	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				258	0	0	506	1247	0	0	1281	0
Grp Sat Flow(s),veh/h/ln				1742	1885	1598	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.2	0.0	0.0	22.4	24.1	0.0	0.0	33.3	0.0
Cycle Q Clear(g_c), s				6.2	0.0	0.0	22.4	24.1	0.0	0.0	33.3	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				766	415		573	2507	0	0	1386	
V/C Ratio(X)				0.34	0.00		0.88	0.50	0.00	0.00	0.92	
Avail Cap(c_a), veh/h				766	415		573	2507	0	0	1386	
HCM Platoon Ratio				1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.17	0.17	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				32.9	0.0	0.0	31.2	14.4	0.0	0.0	22.7	0.0
Incr Delay (d2), s/veh				1.2	0.0	0.0	3.8	0.1	0.0	0.0	11.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.7	0.0	0.0	12.5	10.5	0.0	0.0	14.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				34.0	0.0	0.0	34.9	14.5	0.0	0.0	34.5	0.0
LnGrp LOS				C	A		C	B	A	A	C	
Approach Vol, veh/h					258	A		1753			1281	A
Approach Delay, s/veh					34.0			20.4			34.5	
Approach LOS					C			C			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	43.0		26.0		74.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	27.0	37.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	24.4	35.3		8.2		26.1						
Green Ext Time (p_c), s	0.4	1.3		1.2		4.3						

Intersection Summary

HCM 6th Ctrl Delay	26.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	420	0	150	0	0	0	0	1140	190	580	790	0
Future Volume (vph)	420	0	150	0	0	0	0	1140	190	580	790	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.121		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3574	1599	228	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			233						202			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	447	0	160	0	0	0	0	1213	202	617	840	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	447	0	160	0	0	0	0	1213	202	617	840	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

5:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	25.0	25.0					35.0	35.0	40.0	75.0	
Total Split (%)	25.0%	25.0%	25.0%					35.0%	35.0%	40.0%	75.0%	
Maximum Green (s)	19.0	19.0	19.0					29.0	29.0	36.0	69.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	21.0		21.0					31.0	31.0	71.0	71.0	
Actuated g/C Ratio	0.21		0.21					0.31	0.31	0.71	0.71	
v/c Ratio	0.61		0.31					1.10	0.32	0.85	0.33	
Control Delay	40.0		2.5					90.9	5.2	21.9	0.3	
Queue Delay	0.1		0.0					0.0	0.0	0.4	0.0	
Total Delay	40.1		2.5					90.9	5.2	22.3	0.3	
LOS	D		A					F	A	C	A	
Approach Delay		30.2						78.7			9.6	
Approach LOS		C						E			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 5 (5%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 41.3

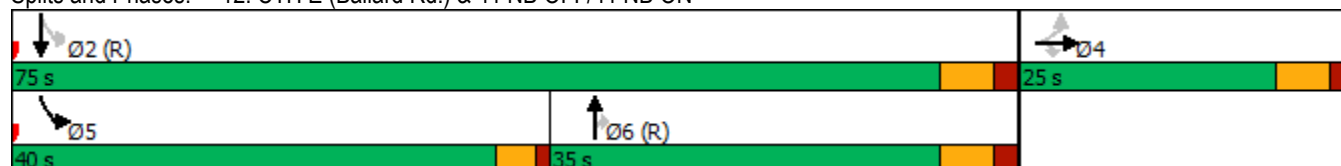
Intersection LOS: D

Intersection Capacity Utilization 85.6%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

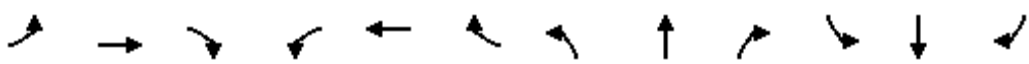
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	420	0	150	0	0	0	0	1140	190	580	790	0
Future Volume (veh/h)	420	0	150	0	0	0	0	1140	190	580	790	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	447	0	0				0	1213	0	617	840	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	731	396					0	1110		718	2543	0
Arrive On Green	0.21	0.00	0.00				0.00	0.62	0.00	0.12	0.23	0.00
Sat Flow, veh/h	3483	1885	1598				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	447	0	0				0	1213	0	617	840	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1791	1598	1795	1791	0
Q Serve(g_s), s	11.6	0.0	0.0				0.0	31.0	0.0	29.6	19.5	0.0
Cycle Q Clear(g_c), s	11.6	0.0	0.0				0.0	31.0	0.0	29.6	19.5	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	731	396					0	1110		718	2543	0
V/C Ratio(X)	0.61	0.00					0.00	1.09		0.86	0.33	0.00
Avail Cap(c_a), veh/h	731	396					0	1110		718	2543	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.45	0.45	0.00
Uniform Delay (d), s/veh	35.8	0.0	0.0				0.0	19.0	0.0	35.7	18.6	0.0
Incr Delay (d2), s/veh	3.8	0.0	0.0				0.0	55.9	0.0	6.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	0.0	0.0				0.0	15.6	0.0	17.4	9.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.6	0.0	0.0				0.0	74.9	0.0	41.9	18.7	0.0
LnGrp LOS	D	A					A	F		D	B	A
Approach Vol, veh/h	447			A			1213			A		
Approach Delay, s/veh	39.6						74.9			28.5		
Approach LOS	D						E			C		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	75.0			25.0			40.0			35.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	69.0			19.0			36.0			29.0		
Max Q Clear Time (g_c+I1), s	21.5			13.6			31.6			33.0		
Green Ext Time (p_c), s	2.5			1.4			0.8			0.0		
Intersection Summary												
HCM 6th Ctrl Delay			48.1									
HCM 6th LOS			D									
Notes												

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (vph)	0	0	0	350	0	120	340	550	0	0	310	200
Future Volume (vph)	0	0	0	350	0	120	340	550	0	0	310	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3574	1599
Flt Permitted					0.950		0.494					
Satd. Flow (perm)	0	0	0	0	1787	1599	929	3574	0	0	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						104						238
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	417	0	143	405	655	0	0	369	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	417	143	405	655	0	0	369	238
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

5:00 pm Baseline

Synchro 10 Report
Page 3

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					24.7	24.7	38.9	38.9			22.6	22.6
Actuated g/C Ratio					0.34	0.34	0.54	0.54			0.32	0.32
v/c Ratio					0.68	0.23	0.62	0.34			0.33	0.36
Control Delay					27.0	7.5	18.9	9.9			20.5	4.9
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					27.0	7.5	18.9	9.9			20.5	4.9
LOS					C	A	B	A			C	A
Approach Delay					22.0			13.3			14.4	
Approach LOS					C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 71.6

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 15.8

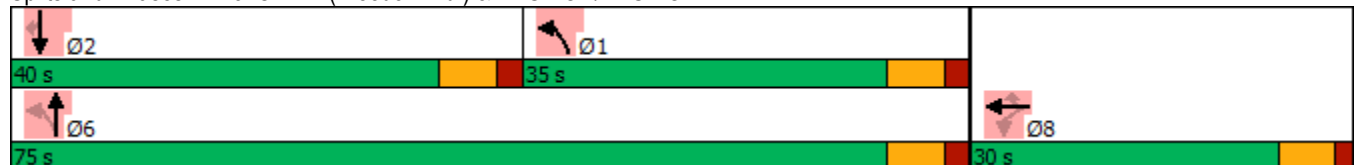
Intersection LOS: B

Intersection Capacity Utilization 64.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↷	↶
Traffic Volume (veh/h)	0	0	0	350	0	120	340	550	0	0	310	200
Future Volume (veh/h)	0	0	0	350	0	120	340	550	0	0	310	200
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1885	1885
Adj Flow Rate, veh/h				417	0	0	405	655	0	0	369	0
Peak Hour Factor				0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %				1	1	1	1	1	0	0	1	1
Cap, veh/h				529	0		621	2078	0	0	1263	
Arrive On Green				0.29	0.00	0.00	0.16	0.58	0.00	0.00	0.35	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3676	1598
Grp Volume(v), veh/h				417	0	0	405	655	0	0	369	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1791	1598
Q Serve(g_s), s				13.6	0.0	0.0	0.6	6.0	0.0	0.0	4.7	0.0
Cycle Q Clear(g_c), s				13.6	0.0	0.0	0.6	6.0	0.0	0.0	4.7	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				529	0		621	2078	0	0	1263	
V/C Ratio(X)				0.79	0.00		0.65	0.32	0.00	0.00	0.29	
Avail Cap(c_a), veh/h				732	0		1198	3987	0	0	2022	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				20.7	0.0	0.0	18.8	6.9	0.0	0.0	14.9	0.0
Incr Delay (d2), s/veh				4.0	0.0	0.0	1.7	0.1	0.0	0.0	0.2	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				5.8	0.0	0.0	5.1	1.8	0.0	0.0	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				24.6	0.0	0.0	20.5	7.0	0.0	0.0	15.1	0.0
LnGrp LOS				C	A		C	A	A	A	B	
Approach Vol, veh/h					417	A		1060			369	A
Approach Delay, s/veh					24.6			12.1			15.1	
Approach LOS					C			B			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		22.8				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.6	6.7				8.0		15.6				
Green Ext Time (p_c), s	2.8	2.6				3.4		1.2				

Intersection Summary

HCM 6th Ctrl Delay	15.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	430	0	360	0	0	0	0	460	140	90	570	0
Future Volume (vph)	430	0	360	0	0	0	0	460	140	90	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1752	1568	0	0	0	0	3438	1538	1752	3505	0
Flt Permitted		0.950								0.432		
Satd. Flow (perm)	0	1752	1568	0	0	0	0	3438	1538	797	3505	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			387						121			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	5%	5%	5%	3%	3%	3%
Adj. Flow (vph)	462	0	387	0	0	0	0	495	151	97	613	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	462	387	0	0	0	0	495	151	97	613	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

5:00 pm Baseline

Synchro 10 Report
Page 6

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effect Green (s)		16.2	16.2					22.8	22.8	36.4	33.8	
Actuated g/C Ratio		0.28	0.28					0.39	0.39	0.63	0.58	
v/c Ratio		0.95	0.54					0.37	0.22	0.14	0.30	
Control Delay		55.8	5.7					14.6	5.5	6.2	6.4	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		55.8	5.7					14.6	5.5	6.2	6.4	
LOS		E	A					B	A	A	A	
Approach Delay		33.0						12.4			6.4	
Approach LOS		C						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 58.1

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 18.4

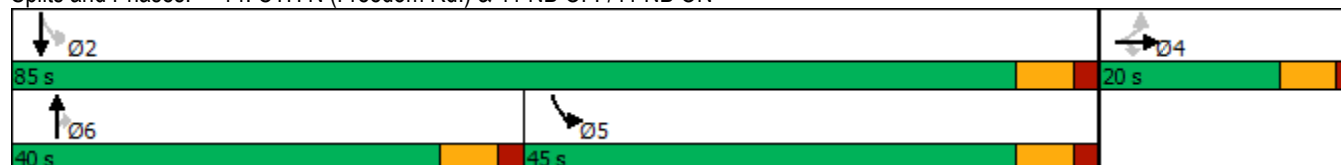
Intersection LOS: B

Intersection Capacity Utilization 64.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	430	0	360	0	0	0	0	460	140	90	570	0
Future Volume (veh/h)	430	0	360	0	0	0	0	460	140	90	570	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1826	1826	1856	1856	0
Adj Flow Rate, veh/h	462	0	0				0	495	0	97	613	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3				0	5	5	3	3	0
Cap, veh/h	464	0					0	1280		592	2138	0
Arrive On Green	0.26	0.00	0.00				0.00	0.37	0.00	0.17	0.61	0.00
Sat Flow, veh/h	1767	0	1572				0	3561	1547	1767	3618	0
Grp Volume(v), veh/h	462	0	0				0	495	0	97	613	0
Grp Sat Flow(s),veh/h/ln	1767	0	1572				0	1735	1547	1767	1763	0
Q Serve(g_s), s	15.9	0.0	0.0				0.0	6.4	0.0	0.0	5.1	0.0
Cycle Q Clear(g_c), s	15.9	0.0	0.0				0.0	6.4	0.0	0.0	5.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	464	0					0	1280		592	2138	0
V/C Ratio(X)	1.00	0.00					0.00	0.39		0.16	0.29	0.00
Avail Cap(c_a), veh/h	464	0					0	2047		1476	4681	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.5	0.0	0.0				0.0	14.2	0.0	13.9	5.7	0.0
Incr Delay (d2), s/veh	40.9	0.0	0.0				0.0	0.2	0.0	0.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.3	0.0	0.0				0.0	2.3	0.0	0.9	1.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.4	0.0	0.0				0.0	14.4	0.0	14.1	5.8	0.0
LnGrp LOS	E	A					A	B		B	A	A
Approach Vol, veh/h		462	A					495	A		710	
Approach Delay, s/veh		63.4						14.4			6.9	
Approach LOS		E						B			A	
Timer - Assigned Phs	2		4		5	6						
Phs Duration (G+Y+Rc), s	41.0		20.0		14.5	26.5						
Change Period (Y+Rc), s	6.5		6.0		6.5	6.5						
Max Green Setting (Gmax), s	78.5		14.0		38.5	33.5						
Max Q Clear Time (g_c+I1), s	7.1		17.9		2.0	8.4						
Green Ext Time (p_c), s	3.2		0.0		0.6	2.3						
Intersection Summary												
HCM 6th Ctrl Delay			24.8									
HCM 6th LOS			C									

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	220	0	140	80	220	0	0	130	50
Future Volume (vph)	0	0	0	220	0	140	80	220	0	0	130	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.948							0.850
Flt Protected					0.970		0.950					
Satd. Flow (prot)	0	0	0	0	1680	0	1787	1881	0	0	1845	1568
Flt Permitted					0.970		0.950					
Satd. Flow (perm)	0	0	0	0	1680	0	1787	1881	0	0	1845	1568
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	1%	1%	1%	3%	3%	3%
Parking (#/hr)			0									
Adj. Flow (vph)	0	0	0	250	0	159	91	250	0	0	148	57
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	409	0	91	250	0	0	148	57
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	15.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕		↕	↑			↑	↗
Traffic Vol, veh/h	0	0	0	220	0	140	80	220	0	0	130	50
Future Vol, veh/h	0	0	0	220	0	140	80	220	0	0	130	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	4	4	4	1	1	1	3	3	3
Mvmt Flow	0	0	0	250	0	159	91	250	0	0	148	57
Major/Minor												
Minor1				Major1				Major2				
Conflicting Flow All	609	637	250	205	0	-	-	-	-	-	0	
Stage 1	432	432	-	-	-	-	-	-	-	-	-	
Stage 2	177	205	-	-	-	-	-	-	-	-	-	
Critical Hdwy	6.44	6.54	6.24	4.11	-	-	-	-	-	-	-	
Critical Hdwy Stg 1	5.44	5.54	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	5.44	5.54	-	-	-	-	-	-	-	-	-	
Follow-up Hdwy	3.536	4.036	3.336	2.209	-	-	-	-	-	-	-	
Pot Cap-1 Maneuver	455	392	784	1372	-	0	0	-	-	-	-	
Stage 1	650	579	-	-	-	0	0	-	-	-	-	
Stage 2	849	728	-	-	-	0	0	-	-	-	-	
Platoon blocked, %					-	-	-	-	-	-	-	
Mov Cap-1 Maneuver	425	0	784	1372	-	-	-	-	-	-	-	
Mov Cap-2 Maneuver	425	0	-	-	-	-	-	-	-	-	-	
Stage 1	607	0	-	-	-	-	-	-	-	-	-	
Stage 2	849	0	-	-	-	-	-	-	-	-	-	
Approach												
WB				NB				SB				
HCM Control Delay, s	33.4			2.1				0				
HCM LOS	D											
Minor Lane/Major Mvmt												
NBL				NBTWBLn1				SBT SBR				
Capacity (veh/h)	1372	-	517	-	-	-	-	-	-	-	-	-
HCM Lane V/C Ratio	0.066	-	0.791	-	-	-	-	-	-	-	-	-
HCM Control Delay (s)	7.8	-	33.4	-	-	-	-	-	-	-	-	-
HCM Lane LOS	A	-	D	-	-	-	-	-	-	-	-	-
HCM 95th %tile Q(veh)	0.2	-	7.4	-	-	-	-	-	-	-	-	-

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	0	70	0	0	0	0	220	130	70	280	0
Future Volume (vph)	80	0	70	0	0	0	0	220	130	70	280	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.937							0.850			
Flt Protected		0.974								0.950		
Satd. Flow (prot)	0	1717	0	0	0	0	0	1845	1568	1787	1881	0
Flt Permitted		0.974								0.950		
Satd. Flow (perm)	0	1717	0	0	0	0	0	1845	1568	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	3%	3%	3%	1%	1%	1%
Adj. Flow (vph)	93	0	81	0	0	0	0	256	151	81	326	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	174	0	0	0	0	0	256	151	81	326	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection													
Int Delay, s/veh	4												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕						↑	↗	↘	↑		
Traffic Vol, veh/h	80	0	70	0	0	0	0	220	130	70	280	0	
Future Vol, veh/h	80	0	70	0	0	0	0	220	130	70	280	0	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None	
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-	
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-	
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86	
Heavy Vehicles, %	1	1	1	4	4	4	3	3	3	1	1	1	
Mvmt Flow	93	0	81	0	0	0	0	256	151	81	326	0	
Major/Minor	Minor2			Major1				Major2					
Conflicting Flow All	820	895	326					-	0	0	407	0	0
Stage 1	488	488	-					-	-	-	-	-	-
Stage 2	332	407	-					-	-	-	-	-	-
Critical Hdwy	6.41	6.51	6.21					-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.41	5.51	-					-	-	-	-	-	-
Critical Hdwy Stg 2	5.41	5.51	-					-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309					-	-	-	2.209	-	-
Pot Cap-1 Maneuver	346	281	718					0	-	-	1157	-	0
Stage 1	619	552	-					0	-	-	-	-	0
Stage 2	729	599	-					0	-	-	-	-	0
Platoon blocked, %									-	-	-		
Mov Cap-1 Maneuver	322	0	718					-	-	-	1157	-	-
Mov Cap-2 Maneuver	322	0	-					-	-	-	-	-	-
Stage 1	576	0	-					-	-	-	-	-	-
Stage 2	729	0	-					-	-	-	-	-	-
Approach	EB			NB				SB					
HCM Control Delay, s	18.8			0				1.7					
HCM LOS	C												
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	SBL	SBT							
Capacity (veh/h)		-	-	434	1157	-							
HCM Lane V/C Ratio		-	-	0.402	0.07	-							
HCM Control Delay (s)		-	-	18.8	8.3	-							
HCM Lane LOS		-	-	C	A	-							
HCM 95th %tile Q(veh)		-	-	1.9	0.2	-							

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	210	80	120	130	0	0	0	0	100	0	290
Future Volume (vph)	0	210	80	120	130	0	0	0	0	100	0	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	247	94	141	153	0	0	0	0	118	0	341
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	247	94	141	153	0	0	0	0	0	118	341
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	33.2%											
Analysis Period (min)	15											
ICU Level of Service A												

Intersection												
Int Delay, s/veh	6.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↑	↗
Traffic Vol, veh/h	0	210	80	120	130	0	0	0	0	100	0	290
Future Vol, veh/h	0	210	80	120	130	0	0	0	0	100	0	290
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	247	94	141	153	0	0	0	0	118	0	341
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	341	0	0				729	776	153
Stage 1	-	-	-	-	-	-				435	435	-
Stage 2	-	-	-	-	-	-				294	341	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1224	-	0				390	328	893
Stage 1	0	-	-	-	-	0				653	580	-
Stage 2	0	-	-	-	-	0				756	639	-
Platoon blocked, %	-	-	-	-	-	-				-	-	-
Mov Cap-1 Maneuver	-	-	-	1224	-	-				345	0	893
Mov Cap-2 Maneuver	-	-	-	-	-	-				345	0	-
Stage 1	-	-	-	-	-	-				578	0	-
Stage 2	-	-	-	-	-	-				756	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			4			13.9					
HCM LOS							B					
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1224	-	345	893						
HCM Lane V/C Ratio	-	-	0.115	-	0.341	0.382						
HCM Control Delay (s)	-	-	8.3	-	20.7	11.5						
HCM Lane LOS	-	-	A	-	C	B						
HCM 95th %tile Q(veh)	-	-	0.4	-	1.5	1.8						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	160	0	0	190	170	60	0	130	0	0	0
Future Volume (vph)	150	160	0	0	190	170	60	0	130	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	170	182	0	0	216	193	68	0	148	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	182	0	0	216	193	0	68	148	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	33.2%											
ICU Level of Service	A											
Analysis Period (min)	15											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	160	0	0	190	170	60	0	130	0	0	0
Future Vol, veh/h	150	160	0	0	190	170	60	0	130	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	170	182	0	0	216	193	68	0	148	0	0	0
Major/Minor	Major1			Major2			Minor1					
Conflicting Flow All	409	0	-	-	-	0	835	931	182			
Stage 1	-	-	-	-	-	-	522	522	-			
Stage 2	-	-	-	-	-	-	313	409	-			
Critical Hdwy	4.11	-	-	-	-	-	6.45	6.55	6.25			
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45	5.55	-			
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45	5.55	-			
Follow-up Hdwy	2.209	-	-	-	-	-	3.545	4.045	3.345			
Pot Cap-1 Maneuver	1155	-	0	0	-	-	334	264	853			
Stage 1	-	-	0	0	-	-	589	526	-			
Stage 2	-	-	0	0	-	-	735	591	-			
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1155	-	-	-	-	-	285	0	853			
Mov Cap-2 Maneuver	-	-	-	-	-	-	285	0	-			
Stage 1	-	-	-	-	-	-	502	0	-			
Stage 2	-	-	-	-	-	-	735	0	-			
Approach	EB			WB			NB					
HCM Control Delay, s	4.2			0			13.7					
HCM LOS							B					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR						
Capacity (veh/h)	285	853	1155	-	-	-						
HCM Lane V/C Ratio	0.239	0.173	0.148	-	-	-						
HCM Control Delay (s)	21.6	10.1	8.7	-	-	-						
HCM Lane LOS	C	B	A	-	-	-						
HCM 95th %tile Q(veh)	0.9	0.6	0.5	-	-	-						

APPENDIX O3

Year 2028 No Build HCS7 (Roundabouts) AM & PM Peak Hour

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	50	0	270					0		500	130	0	30	250	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	58	0	314					0		571	148	0	34	283	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		58.00	314.00				342.60	228.40	148.00	28.53	288.47	
Entry Volume veh/h		54.21	293.46				326.29	217.52	140.95	27.43	277.38	
Circulating Flow (v_c), pc/h	317			629			92			0		
Exiting Flow (v_{ex}), pc/h	34			0			629			283		
Capacity (C_{PCE}), pc/h		1022.62	1031.70				1196.93	1196.93	1252.16	1285.71	1285.71	
Capacity (c), veh/h		955.72	964.20				1139.93	1139.93	1192.53	1236.26	1236.26	
v/c Ratio (x)		0.06	0.30				0.29	0.19	0.12	0.02	0.22	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.3	6.9				5.9	4.9	4.0	3.1	4.9	
Lane LOS		A	A				A	A	A	A	A	
95% Queue, veh		0.2	1.3				1.2	0.7	0.4	0.1	0.9	
Approach Delay, s/veh	6.5						5.2			4.7		
Approach LOS	A						A			A		
Intersection Delay, s/veh LOS	5.4						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT			L	T				T	
Volume (V), veh/h					0	80	0	70	0	270	280		0		200	140
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (V_{PCE}), pc/h					0	87	0	76	0	293	304		0		222	155
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					87.00	76.00	293.00	304.00			222.00	155.00
Entry Volume veh/h					86.14	75.25	290.10	300.99			215.53	150.49
Circulating Flow (v_c), pc/h	309			597			0			380		
Exiting Flow (v_{ex}), pc/h	0			293			304			309		
Capacity (C_{PCE}), pc/h					835.39	1014.98	1285.71	1285.71			956.72	1023.70
Capacity (c), veh/h					827.12	1004.93	1272.98	1272.98			928.86	993.89
v/c Ratio (x)					0.10	0.07	0.23	0.24			0.23	0.15

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					5.4	4.2	4.8	4.9			6.2	5.0
Lane LOS					A	A	A	A			A	A
95% Queue, veh					0.3	0.2	0.9	0.9			0.9	0.5
Approach Delay, s/veh				4.9			4.8			5.7		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	5.1						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.86
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR								TR				LT			
Volume (V), veh/h	0	150	0	120					0		290	350	0	80	180	
Percent Heavy Vehicles, %	0	1	0	1					0		3	3	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	176	0	141					0		347	419	0	97	218	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000						4.2000			4.2000	
Follow-Up Headway (s)		2.8000						2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		317.00						766.00			315.00	
Entry Volume veh/h		313.86						743.69			302.88	
Circulating Flow (v_c), pc/h	315			523			273			0		
Exiting Flow (v_{ex}), pc/h	516			0			523			359		
Capacity (C_{PCE}), pc/h		1006.33						1039.75			1285.71	
Capacity (c), veh/h		996.37						1009.47			1236.26	
v/c Ratio (x)		0.32						0.74			0.25	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.8						16.5			5.1	
Lane LOS		A						C			A	
95% Queue, veh		1.4						6.9			1.0	
Approach Delay, s/veh	6.8						16.5			5.1		
Approach LOS	A						C			A		
Intersection Delay, s/veh LOS	11.7						B					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.88
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LTR				LT				TR	
Volume (V), veh/h					0	130	0	60	0	180	260		0		130	230
Percent Heavy Vehicles, %					0	9	0	9	0	1	1		0		17	17
Flow Rate (v_{pce}), pc/h					0	161	0	74	0	207	298		0		173	306
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000			4.2000			4.2000	
Follow-Up Headway (s)					2.8000			2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					235.00			505.00			479.00	
Entry Volume veh/h					215.60			500.00			409.40	
Circulating Flow (v_c), pc/h	334			505			0			368		
Exiting Flow (v_{ex}), pc/h	0			513			372			334		
Capacity (c_{pce}), pc/h					868.09			1285.71			965.69	
Capacity (c), veh/h					796.41			1272.98			825.38	
v/c Ratio (x)					0.27			0.39			0.50	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					7.5			6.6			11.1	
Lane LOS					A			A			B	
95% Queue, veh					1.1			1.9			2.8	
Approach Delay, s/veh				7.5			6.6			11.1		
Approach LOS				A			A			B		
Intersection Delay, s/veh LOS	8.4						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	90	0	370					0		570	120	0	30	350	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	105	0	430					0		651	137	0	34	396	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		105.00	430.00				488.25	162.75	137.00	30.10	399.90	
Entry Volume veh/h		98.13	401.87				465.00	155.00	130.48	28.94	384.52	
Circulating Flow (v_c), pc/h	430			756			139			0		
Exiting Flow (v_{ex}), pc/h	34			0			756			396		
Capacity (C_{PCE}), pc/h		942.48	944.89				1153.96	1153.96	1252.16	1285.71	1285.71	
Capacity (c), veh/h		880.82	883.08				1099.01	1099.01	1192.53	1236.26	1236.26	
v/c Ratio (x)		0.11	0.46				0.42	0.14	0.11	0.02	0.31	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.2	9.7				7.8	4.5	3.9	3.1	5.8	
Lane LOS		A	A				A	A	A	A	A	
95% Queue, veh		0.4	2.4				2.1	0.5	0.4	0.1	1.3	
Approach Delay, s/veh	8.8						6.4			5.6		
Approach LOS	A						A			A		
Intersection Delay, s/veh LOS	6.9						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT		L		T				T	
Volume (V), veh/h					0	190	0	50	0	410	250		0		190	80
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (v_{pce}), pc/h					0	206	0	54	0	445	272		0		210	89
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					206.00	54.00	445.00	272.00			210.00	89.00
Entry Volume veh/h					203.96	53.47	440.59	269.31			203.88	86.41
Circulating Flow (v_c), pc/h	416			717			0			651		
Exiting Flow (v_{ex}), pc/h	0			445			272			416		
Capacity (c_{pce}), pc/h					766.04	1040.56	1285.71	1285.71			774.90	909.56
Capacity (c), veh/h					758.46	1030.26	1272.98	1272.98			752.33	883.07
v/c Ratio (x)					0.27	0.05	0.35	0.21			0.27	0.10

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					7.8	3.9	6.0	4.6			7.9	5.0
Lane LOS					A	A	A	A			A	A
95% Queue, veh					1.1	0.2	1.6	0.8			1.1	0.3
Approach Delay, s/veh				7.0			5.5			7.0		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	6.2						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR								TR				LT			
Volume (V), veh/h	0	160	0	300					0		210	220	0	90	460	
Percent Heavy Vehicles, %	0	1	0	1					0		2	2	0	3	3	
Flow Rate (V_{PCE}), pc/h	0	180	0	337					0		238	249	0	103	526	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000						4.2000			4.2000	
Follow-Up Headway (s)		2.8000						2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		517.00						487.00			629.00	
Entry Volume veh/h		511.88						477.45			610.68	
Circulating Flow (v_c), pc/h	629			418			283			0		
Exiting Flow (v_{ex}), pc/h	352			0			418			863		
Capacity (C_{PCE}), pc/h		788.28						1031.70			1285.71	
Capacity (c), veh/h		780.47						1011.47			1248.27	
v/c Ratio (x)		0.66						0.47			0.49	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		16.2						9.1			8.1	
Lane LOS		C						A			A	
95% Queue, veh		5.0						2.6			2.8	
Approach Delay, s/veh	16.2						9.1			8.1		
Approach LOS	C						A			A		
Intersection Delay, s/veh LOS	11.0						B					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2028
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.78
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LTR				LT				TR	
Volume (V), veh/h					0	320	0	110	0	100	270		0		230	230
Percent Heavy Vehicles, %					0	4	0	4	0	1	1		0		7	7
Flow Rate (v_{pce}), pc/h					0	427	0	147	0	129	350		0		316	316
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000			4.2000			4.2000	
Follow-Up Headway (s)					2.8000			2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					574.00			479.00			632.00	
Entry Volume veh/h					551.92			474.26			590.65	
Circulating Flow (v_c), pc/h	743			479			0			556		
Exiting Flow (v_{ex}), pc/h	0			445			497			743		
Capacity (c_{pce}), pc/h					885.82			1285.71			834.33	
Capacity (c), veh/h					851.75			1272.98			779.74	
v/c Ratio (x)					0.65			0.37			0.76	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					14.9			6.4			21.3	
Lane LOS					B			A			C	
95% Queue, veh					4.9			1.8			7.2	
Approach Delay, s/veh				14.9			6.4			21.3		
Approach LOS				B			A			C		
Intersection Delay, s/veh LOS	14.7						B					

APPENDIX O4

Year 2028 No Build with Retimings Synchro AM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↑	↑	↑						↑	↑
Traffic Volume (vph)	0	550	210	160	490	0	0	0	0	130	0	460
Future Volume (vph)	0	550	210	160	490	0	0	0	0	130	0	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1792	1524	1719	1810	0	0	0	0	0	1656	1482
Flt Permitted				0.099							0.950	
Satd. Flow (perm)	0	1792	1524	179	1810	0	0	0	0	0	1656	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			236									225
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	1%	1%	1%	9%	9%	9%
Adj. Flow (vph)	0	705	269	205	628	0	0	0	0	167	0	590
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	705	269	205	628	0	0	0	0	0	167	590
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		40.0	40.0	16.0	56.0					44.0	44.0	44.0
Total Split (%)		40.0%	40.0%	16.0%	56.0%					44.0%	44.0%	44.0%
Maximum Green (s)		33.5	33.5	9.5	49.5					38.0	38.0	38.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effct Green (s)		36.3	36.3	52.1	52.1						32.3	32.3
Actuated g/C Ratio		0.39	0.39	0.56	0.56						0.35	0.35
v/c Ratio		1.00	0.36	0.69	0.62						0.29	0.89
Control Delay		65.5	6.1	44.9	18.5						22.5	34.0
Queue Delay		0.0	0.0	0.0	2.7						0.0	0.0
Total Delay		65.5	6.1	44.9	21.2						22.5	34.0
LOS		E	A	D	C						C	C
Approach Delay		49.1			27.0						31.4	
Approach LOS		D			C						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 92.4

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 36.7

Intersection LOS: D

Intersection Capacity Utilization 64.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

 Ø2	 Ø4
56 s	44 s
 Ø6	 Ø5
40 s	16 s

HCM 6th Signalized Intersection Summary
1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (veh/h)	0	550	210	160	490	0	0	0	0	130	0	460
Future Volume (veh/h)	0	550	210	160	490	0	0	0	0	130	0	460
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1811	1811	1826	1826	0				1767	1767	1767
Adj Flow Rate, veh/h	0	705	269	205	628	0				167	0	590
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	6	6	5	5	0				9	9	9
Cap, veh/h	0	655	555	274	946	0				676	0	601
Arrive On Green	0.00	0.36	0.36	0.12	0.52	0.00				0.40	0.00	0.40
Sat Flow, veh/h	0	1811	1535	1739	1826	0				1682	0	1497
Grp Volume(v), veh/h	0	705	269	205	628	0				167	0	590
Grp Sat Flow(s),veh/h/ln	0	1811	1535	1739	1826	0				1682	0	1497
Q Serve(g_s), s	0.0	36.0	13.5	7.1	25.2	0.0				6.6	0.0	38.7
Cycle Q Clear(g_c), s	0.0	36.0	13.5	7.1	25.2	0.0				6.6	0.0	38.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	655	555	274	946	0				676	0	601
V/C Ratio(X)	0.00	1.08	0.48	0.75	0.66	0.00				0.25	0.00	0.98
Avail Cap(c_a), veh/h	0	655	555	282	954	0				676	0	601
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	31.8	24.6	40.8	17.6	0.0				19.8	0.0	29.4
Incr Delay (d2), s/veh	0.0	57.6	0.9	10.2	2.0	0.0				0.2	0.0	31.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	25.6	5.0	5.2	10.5	0.0				2.6	0.0	31.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	89.4	25.5	50.9	19.6	0.0				20.0	0.0	61.2
LnGrp LOS	A	F	C	D	B	A				B	A	E
Approach Vol, veh/h		974			833						757	
Approach Delay, s/veh		71.8			27.3						52.1	
Approach LOS		E			C						D	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		55.6		44.0	15.6	40.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		49.5		38.0	9.5	33.5						
Max Q Clear Time (g_c+l1), s		27.2		40.7	9.1	38.0						
Green Ext Time (p_c), s		4.5		0.0	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			51.5									
HCM 6th LOS			D									

Lanes, Volumes, Timings
2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	420	260	650	80	0	0
Future Volume (vph)	420	260	650	80	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1736	1827	1863	1583	0	0
Flt Permitted	0.177					
Satd. Flow (perm)	323	1827	1863	1583	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				98		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Adj. Flow (vph)	512	317	793	98	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	512	317	793	98	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0	20.0		
Minimum Split (s)	20.5	26.5	26.5	26.5		

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effct Green (s)	47.2	51.2	26.3	26.3		
Actuated g/C Ratio	0.92	1.00	0.51	0.51		
v/c Ratio	0.67	0.17	0.83	0.11		
Control Delay	11.5	0.2	23.1	2.9		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	11.7	0.2	23.1	2.9		
LOS	B	A	C	A		
Approach Delay		7.3	20.9			
Approach LOS		A	C			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 51.2
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 14.3
Intersection Capacity Utilization 64.1%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service C

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON

← Ø2	→ Ø1
30 s	38 s
→ Ø6	
100 s	

HCM 6th Signalized Intersection Summary 2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	420	260	650	80	0	0
Future Volume (veh/h)	420	260	650	80	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1841	1841	1870	1870		
Adj Flow Rate, veh/h	512	317	793	98		
Peak Hour Factor	0.82	0.82	0.82	0.82		
Percent Heavy Veh, %	4	4	2	2		
Cap, veh/h	711	1668	993	841		
Arrive On Green	0.28	0.91	0.53	0.53		
Sat Flow, veh/h	1753	1841	1870	1585		
Grp Volume(v), veh/h	512	317	793	98		
Grp Sat Flow(s),veh/h/ln	1753	1841	1870	1585		
Q Serve(g_s), s	5.1	0.8	14.7	1.3		
Cycle Q Clear(g_c), s	5.1	0.8	14.7	1.3		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	711	1668	993	841		
V/C Ratio(X)	0.72	0.19	0.80	0.12		
Avail Cap(c_a), veh/h	1617	4147	1141	967		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	11.6	0.2	8.1	5.0		
Incr Delay (d2), s/veh	1.4	0.1	4.0	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.3	0.0	4.8	0.3		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.0	0.3	12.1	5.1		
LnGrp LOS	B	A	B	A		
Approach Vol, veh/h		829	891			
Approach Delay, s/veh		8.1	11.3			
Approach LOS		A	B			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	16.0	26.6			42.6	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	7.1	16.7			2.8	
Green Ext Time (p_c), s	2.3	3.4			2.2	
Intersection Summary						
HCM 6th Ctrl Delay			9.8			
HCM 6th LOS			A			

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↙	↗
Traffic Volume (vph)	260	0	0	520	210	450
Future Volume (vph)	260	0	0	520	210	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1845	0	0	1881	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1845	0	0	1881	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						529
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	1%	1%	2%	2%
Adj. Flow (vph)	310	0	0	619	250	536
Shared Lane Traffic (%)						
Lane Group Flow (vph)	310	0	0	619	250	536
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	CI+Ex			CI+Ex	CI+Ex	CI+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Walk Time (s)	5.0			5.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		
Act Effct Green (s)	28.5			28.5	17.5	17.5
Actuated g/C Ratio	0.52			0.52	0.32	0.32
v/c Ratio	0.32			0.63	0.44	0.62
Control Delay	9.1			13.2	18.5	5.5
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.1			13.2	18.5	5.5
LOS	A			B	B	A
Approach Delay	9.1			13.2	9.7	
Approach LOS	A			B	A	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 54.4
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 10.8
Intersection Capacity Utilization 51.2%
Analysis Period (min) 15
Intersection LOS: B
ICU Level of Service A

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)

← Ø2	↖ Ø4
59 s	41 s
→ Ø6	
59 s	

HCM 6th Signalized Intersection Summary

3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	260	0	0	520	210	450
Future Volume (veh/h)	260	0	0	520	210	450
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1885	1870	1870
Adj Flow Rate, veh/h	310	0	0	619	250	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	0	0	1	2	2
Cap, veh/h	985	0	0	1001	492	
Arrive On Green	0.53	0.00	0.00	0.53	0.28	0.00
Sat Flow, veh/h	1856	0	0	1885	1781	1585
Grp Volume(v), veh/h	310	0	0	619	250	0
Grp Sat Flow(s), veh/h/ln	1856	0	0	1885	1781	1585
Q Serve(g_s), s	3.9	0.0	0.0	9.5	4.9	0.0
Cycle Q Clear(g_c), s	3.9	0.0	0.0	9.5	4.9	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	985	0	0	1001	492	
V/C Ratio(X)	0.31	0.00	0.00	0.62	0.51	
Avail Cap(c_a), veh/h	2463	0	0	2502	1591	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.5	0.0	0.0	6.8	12.6	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.9	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.0	2.6	1.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.7	0.0	0.0	7.7	13.4	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	310			619	250	A
Approach Delay, s/veh	5.7			7.7	13.4	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	26.0		15.4		26.0	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	11.5		6.9		5.9	
Green Ext Time (p_c), s	5.0		1.0		2.1	

Intersection Summary

HCM 6th Ctrl Delay	8.4
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	550	160	290	660	0	0	0	0	210	0	340
Future Volume (vph)	0	550	160	290	660	0	0	0	0	210	0	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0			450		450
Storage Lanes	0		1	1		0	0			1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			186									395
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	640	186	337	767	0	0	0	0	244	0	395
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	640	186	337	767	0	0	0	0	0	244	395
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	5.0	5.0					7.0	7.0	7.0
Minimum Split (s)		9.0	9.0	10.0	11.0					13.0	13.0	13.0

7:00 am Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.39	0.29	0.52	0.30					0.76	0.47	0.47
Control Delay		27.3	5.1	19.5	17.6					55.5	5.6	5.6
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		27.3	5.1	19.5	17.6					55.5	5.6	5.6
LOS		C	A	B	B					E	A	A
Approach Delay		22.3			18.2					24.7		
Approach LOS		C			B					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 22 (22%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 21.1

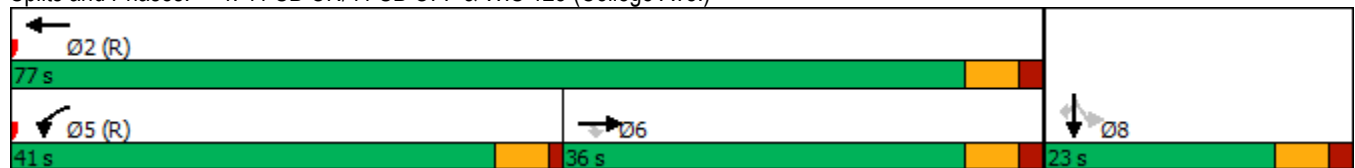
Intersection LOS: C

Intersection Capacity Utilization 42.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	550	160	290	660	0	0	0	0	210	0	340
Future Volume (veh/h)	0	550	160	290	660	0	0	0	0	210	0	340
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	640	0	337	767	0				244	0	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86				0.86	0.86	0.86
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	2382		398	2594	0				677	0	
Arrive On Green	0.00	0.15	0.00	0.22	0.73	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1781	3647	0				3563	0	3170
Grp Volume(v), veh/h	0	640	0	337	767	0				244	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	11.1	0.0	18.1	7.4	0.0				6.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	11.1	0.0	18.1	7.4	0.0				6.0	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2382		398	2594	0				677	0	
V/C Ratio(X)	0.00	0.27		0.85	0.30	0.00				0.36	0.00	
Avail Cap(c_a), veh/h	0	2382		659	2594	0				677	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.79	0.79	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	27.3	0.0	37.2	4.6	0.0				35.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	4.3	0.2	0.0				1.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.1	0.0	8.2	2.3	0.0				2.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	27.5	0.0	41.5	4.9	0.0				36.7	0.0	0.0
LnGrp LOS	A	C		D	A	A				D	A	
Approach Vol, veh/h		640	A		1104						244	A
Approach Delay, s/veh		27.5			16.1						36.7	
Approach LOS		C			B						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		77.0			26.4	50.6		23.0				
Change Period (Y+Rc), s		6.0			5.0	6.0		6.0				
Max Green Setting (Gmax), s		71.0			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		9.4			20.1	13.1		8.0				
Green Ext Time (p_c), s		4.2			1.2	2.9		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			22.3									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	580	0	0	650	120	300	0	430	0	0	0
Future Volume (vph)	180	580	0	0	650	120	300	0	430	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.237						0.950					
Satd. Flow (perm)	446	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						140			530			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	209	674	0	0	756	140	349	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	209	674	0	0	756	140	349	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	72.0			37.0	37.0	28.0	28.0	28.0			
Total Split (%)	35.0%	72.0%			37.0%	37.0%	28.0%	28.0%	28.0%			
Maximum Green (s)	29.0	66.0			31.0	31.0	23.0	23.0	23.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	68.0	68.0			33.0	33.0	24.0		24.0			
Actuated g/C Ratio	0.68	0.68			0.33	0.33	0.24		0.24			
v/c Ratio	0.29	0.28			0.45	0.23	0.87		0.47			
Control Delay	18.7	7.8			27.4	5.2	59.1		3.7			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	18.7	7.8			27.4	5.2	59.1		3.7			
LOS	B	A			C	A	E		A			
Approach Delay	10.4				24.0		26.5					
Approach LOS	B				C		C					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 20.2

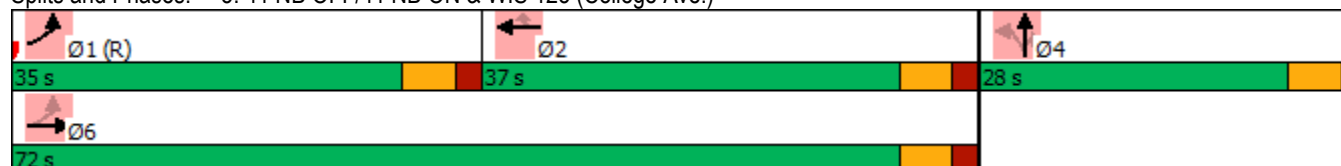
Intersection LOS: C

Intersection Capacity Utilization 42.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (veh/h)	180	580	0	0	650	120	300	0	430	0	0	0
Future Volume (veh/h)	180	580	0	0	650	120	300	0	430	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	209	674	0	0	756	0	349	0	0			
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	538	2436	0	0	2795		855	0				
Arrive On Green	0.09	0.68	0.00	0.00	0.18	0.00	0.24	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	209	674	0	0	756	0	349	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	4.5	7.4	0.0	0.0	12.8	0.0	8.3	0.0	0.0			
Cycle Q Clear(g_c), s	4.5	7.4	0.0	0.0	12.8	0.0	8.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	538	2436	0	0	2795		855	0				
V/C Ratio(X)	0.39	0.28	0.00	0.00	0.27		0.41	0.00				
Avail Cap(c_a), veh/h	928	2436	0	0	2795		855	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.93	0.93	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	8.1	6.3	0.0	0.0	23.8	0.0	32.0	0.0	0.0			
Incr Delay (d2), s/veh	0.4	0.3	0.0	0.0	0.2	0.0	1.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.6	2.6	0.0	0.0	5.8	0.0	3.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.5	6.6	0.0	0.0	24.0	0.0	33.5	0.0	0.0			
LnGrp LOS	A	A	A	A	C		C	A				
Approach Vol, veh/h	883			756			A			349		
Approach Delay, s/veh	7.0			24.0			33.5					
Approach LOS	A			C			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	13.3	58.7		28.0		72.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	31.0		23.0		66.0						
Max Q Clear Time (g_c+I1), s	6.5	14.8		10.3		9.4						
Green Ext Time (p_c), s	0.8	3.4		1.3		3.5						

Intersection Summary

HCM 6th Ctrl Delay 18.1

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	650	210	380	650	0	0	0	0	160	0	290
Future Volume (vph)	0	650	210	380	650	0	0	0	0	160	0	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1770	1583
Flt Permitted				0.181							0.950	
Satd. Flow (perm)	0	5085	1583	337	3539	0	0	0	0	0	1770	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			269									231
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	833	269	487	833	0	0	0	0	205	0	372
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	833	269	487	833	0	0	0	0	0	205	372
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	73.7	73.7						18.3	18.3
Actuated g/C Ratio		0.30	0.30	0.74	0.74						0.18	0.18
v/c Ratio		0.55	0.41	0.60	0.32						0.63	0.78
Control Delay		30.9	5.4	7.3	0.5						46.3	26.1
Queue Delay		0.0	0.0	1.2	0.5						0.0	0.0
Total Delay		31.0	5.4	8.5	1.1						46.3	26.1
LOS		C	A	A	A						D	C
Approach Delay		24.7			3.8						33.2	
Approach LOS		C			A						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 17.2

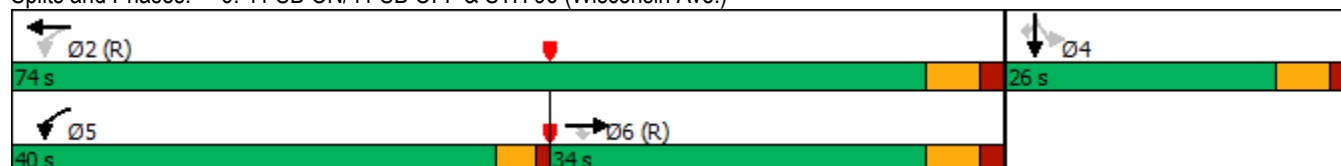
Intersection LOS: B

Intersection Capacity Utilization 52.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (veh/h)	0	650	210	380	650	0	0	0	0	160	0	290
Future Volume (veh/h)	0	650	210	380	650	0	0	0	0	160	0	290
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	833	0	487	833	0				205	0	372
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1532		808	2488	0				392	0	349
Arrive On Green	0.00	0.30	0.00	0.72	1.00	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1781	0	1585
Grp Volume(v), veh/h	0	833	0	487	833	0				205	0	372
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	13.6	0.0	9.0	0.0	0.0				10.1	0.0	22.0
Cycle Q Clear(g_c), s	0.0	13.6	0.0	9.0	0.0	0.0				10.1	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		808	2488	0				392	0	349
V/C Ratio(X)	0.00	0.54		0.60	0.33	0.00				0.52	0.00	1.07
Avail Cap(c_a), veh/h	0	1532		808	2488	0				392	0	349
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.65	0.65	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	29.3	0.0	4.0	0.0	0.0				34.4	0.0	39.0
Incr Delay (d2), s/veh	0.0	1.4	0.0	2.2	0.2	0.0				1.3	0.0	67.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.7	0.0	2.1	0.1	0.0				4.5	0.0	23.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	30.7	0.0	6.2	0.2	0.0				35.6	0.0	106.0
LnGrp LOS	A	C		A	A	A				D	A	F
Approach Vol, veh/h		833	A		1320						577	
Approach Delay, s/veh		30.7			2.4						81.0	
Approach LOS		C			A						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		2.0		24.0	11.0	15.6						
Green Ext Time (p_c), s		7.5		0.0	1.2	4.7						
Intersection Summary												
HCM 6th Ctrl Delay			27.7									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	640	0	0	740	70	290	0	380	0	0	0
Future Volume (vph)	170	640	0	0	740	70	290	0	380	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.150						0.950					
Satd. Flow (perm)	279	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						86			251			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	210	790	0	0	914	86	358	0	469	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	210	790	0	0	914	86	358	0	469	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	0.29	0.32			0.60	0.16	0.97		0.86			
Control Delay	1.5	2.9			31.8	6.6	80.2		34.6			
Queue Delay	0.0	0.7			0.0	0.0	0.0		0.0			
Total Delay	1.5	3.6			31.9	6.6	80.2		34.6			
LOS	A	A			C	A	F		C			
Approach Delay		3.2			29.7			54.3				
Approach LOS		A			C			D				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 27.5

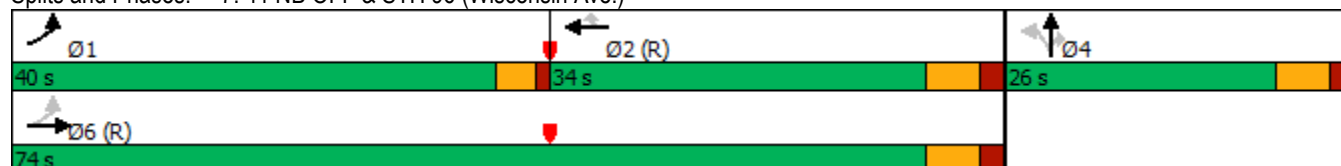
Intersection LOS: C

Intersection Capacity Utilization 52.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	170	640	0	0	740	70	290	0	380	0	0	0
Future Volume (veh/h)	170	640	0	0	740	70	290	0	380	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	210	790	0	0	914	86	358	0	0			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	836	2750	0	0	1909	593	521	0				
Arrive On Green	0.24	0.52	0.00	0.00	0.37	0.37	0.15	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	210	790	0	0	914	86	358	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	4.0	12.6	0.0	0.0	13.7	3.6	9.5	0.0	0.0			
Cycle Q Clear(g_c), s	4.0	12.6	0.0	0.0	13.7	3.6	9.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	836	2750	0	0	1909	593	521	0				
V/C Ratio(X)	0.25	0.29	0.00	0.00	0.48	0.15	0.69	0.00				
Avail Cap(c_a), veh/h	836	2750	0	0	1909	593	784	0				
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.82	0.82	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	7.4	8.5	0.0	0.0	23.9	20.7	40.5	0.0	0.0			
Incr Delay (d2), s/veh	0.6	0.2	0.0	0.0	0.9	0.5	1.6	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.4	5.4	0.0	0.0	5.5	1.4	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.0	8.7	0.0	0.0	24.7	21.2	42.2	0.0	0.0			
LnGrp LOS	A	A	A	A	C	C	D	A				
Approach Vol, veh/h	1000			1000			358			A		
Approach Delay, s/veh	8.5			24.4			42.2					
Approach LOS	A			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	41.4		18.6		81.4						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	6.0	15.7		11.5		14.6						
Green Ext Time (p_c), s	0.5	5.5		1.1		6.9						

Intersection Summary

HCM 6th Ctrl Delay	20.4
HCM 6th LOS	C

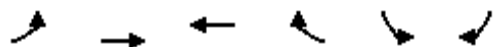
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019

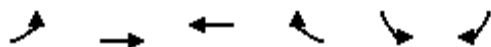


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	200	1240	650	380	190	810
Future Volume (vph)	200	1240	650	380	190	810
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1763	3539	3505	1568	1770	1583
Flt Permitted	0.150				0.950	
Satd. Flow (perm)	278	3539	3505	1568	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				500		276
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	263	1632	855	500	250	1066
Shared Lane Traffic (%)						
Lane Group Flow (vph)	263	1632	855	500	250	1066
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	16.0
Total Split (s)	15.0	45.0	45.0	45.0	40.0	40.0
Total Split (%)	15.0%	45.0%	45.0%	45.0%	40.0%	40.0%
Maximum Green (s)	10.0	39.0	39.0	39.0	34.0	34.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	Min	Min	Min	None	None
Act Effct Green (s)	48.1	48.1	33.0	33.0	36.1	36.1
Actuated g/C Ratio	0.52	0.52	0.36	0.36	0.39	0.39
v/c Ratio	0.82	0.89	0.68	0.57	0.36	1.35
Control Delay	36.9	26.4	28.0	4.6	22.9	188.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.9	26.4	28.0	4.6	22.9	188.8
LOS	D	C	C	A	C	F
Approach Delay		27.9	19.4		157.3	
Approach LOS		C	B		F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 92.2

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.35

Intersection Signal Delay: 62.7

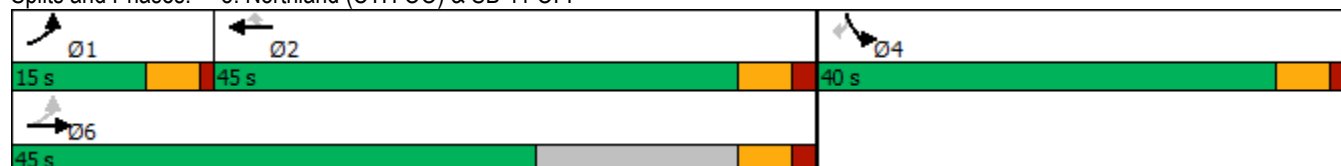
Intersection LOS: E

Intersection Capacity Utilization 74.8%

ICU Level of Service D

Analysis Period (min) 15

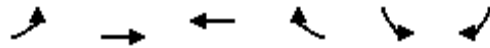
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	200	1240	650	380	190	810
Future Volume (veh/h)	200	1240	650	380	190	810
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	263	1632	855	0	250	0
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	522	2231	1440		400	
Arrive On Green	0.15	0.63	0.41	0.00	0.22	0.00
Sat Flow, veh/h	1781	3647	3618	1572	1781	1585
Grp Volume(v), veh/h	263	1632	855	0	250	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1763	1572	1781	1585
Q Serve(g_s), s	4.0	17.1	10.2	0.0	6.9	0.0
Cycle Q Clear(g_c), s	4.0	17.1	10.2	0.0	6.9	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	522	2231	1440		400	
V/C Ratio(X)	0.50	0.73	0.59		0.63	
Avail Cap(c_a), veh/h	625	2693	2671		1185	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	8.1	6.9	12.5	0.0	18.9	0.0
Incr Delay (d2), s/veh	0.8	1.0	0.4	0.0	2.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	4.4	3.5	0.0	2.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.9	7.9	12.9	0.0	21.2	0.0
LnGrp LOS	A	A	B		C	
Approach Vol, veh/h		1895	855	A	250	A
Approach Delay, s/veh		8.1	12.9		21.2	
Approach LOS		A	B		C	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	11.9	26.1		16.1		38.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	10.0	39.0		34.0		39.0
Max Q Clear Time (g_c+I1), s	6.0	12.2		8.9		19.1
Green Ext Time (p_c), s	0.4	4.5		1.5		12.9

Intersection Summary

HCM 6th Ctrl Delay	10.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	600	830	0	0	840	150	190	0	440	0	0	0
Future Volume (vph)	600	830	0	0	840	150	190	0	440	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	3574	0	0	3539	1583	0	1671	1495	0	0	0
Flt Permitted	0.106							0.950				
Satd. Flow (perm)	199	3574	0	0	3539	1583	0	1671	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						197			130			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	789	1092	0	0	1105	197	250	0	579	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	789	1092	0	0	1105	197	0	250	579	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0	10.0			
Minimum Split (s)	12.0	26.0			36.0	36.0	20.0	20.0	20.0			

7:00 am Baseline

Synchro 10 Report
Page 7

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	40.0			40.0	40.0	25.0	25.0	25.0			
Total Split (%)	27.8%	44.4%			44.4%	44.4%	27.8%	27.8%	27.8%			
Maximum Green (s)	20.0	34.0			34.0	34.0	19.0	19.0	19.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lead/Lag	Lead				Lag				Lag			
Lead-Lag Optimize?	Yes				Yes				Yes			
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0	4.0			
Recall Mode	None	Min			Min	Min	None	None	None			
Act Effct Green (s)	59.7	59.7			34.7	34.7		21.0	21.0			
Actuated g/C Ratio	0.67	0.67			0.39	0.39		0.24	0.24			
v/c Ratio	1.55	0.45			0.80	0.27		0.63	1.28			
Control Delay	279.7	7.5			29.2	3.7		39.1	166.8			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	279.7	7.5			29.2	3.7		39.1	166.8			
LOS	F	A			C	A		D	F			
Approach Delay	121.7				25.3				128.3			
Approach LOS	F				C				F			

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 88.7

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.55

Intersection Signal Delay: 91.8

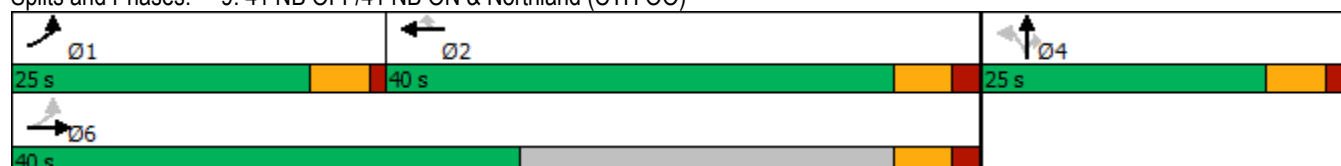
Intersection LOS: F

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary
 9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	600	830	0	0	840	150	190	0	440	0	0	0
Future Volume (veh/h)	600	830	0	0	840	150	190	0	440	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781			
Adj Flow Rate, veh/h	789	1092	0	0	1105	0	250	0	0			
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76			
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8			
Cap, veh/h	614	2520	0	0	1393		334	0				
Arrive On Green	0.26	0.70	0.00	0.00	0.39	0.00	0.20	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3647	1585	1697	0	1510			
Grp Volume(v), veh/h	789	1092	0	0	1105	0	250	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1777	1585	1697	0	1510			
Q Serve(g_s), s	21.0	10.4	0.0	0.0	22.0	0.0	11.1	0.0	0.0			
Cycle Q Clear(g_c), s	21.0	10.4	0.0	0.0	22.0	0.0	11.1	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	614	2520	0	0	1393		334	0				
V/C Ratio(X)	1.29	0.43	0.00	0.00	0.79		0.75	0.00				
Avail Cap(c_a), veh/h	614	2520	0	0	1595		444	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	20.5	5.1	0.0	0.0	21.5	0.0	30.4	0.0	0.0			
Incr Delay (d2), s/veh	140.5	0.1	0.0	0.0	2.8	0.0	6.0	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	35.0	3.0	0.0	0.0	9.1	0.0	5.0	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	161.0	5.2	0.0	0.0	24.3	0.0	36.4	0.0	0.0			
LnGrp LOS	F	A	A	A	C		D	A				
Approach Vol, veh/h	1881			1105			A			250		
Approach Delay, s/veh	70.5			24.3			36.4					
Approach LOS	E			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	25.0	35.4		19.8		60.4						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	20.0	34.0		19.0		34.0						
Max Q Clear Time (g_c+I1), s	23.0	24.0		13.1		12.4						
Green Ext Time (p_c), s	0.0	5.4		0.7		5.8						

Intersection Summary

HCM 6th Ctrl Delay	52.1
HCM 6th LOS	D

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frts						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	270	0	150	0	0	0	0	560	420	300	620	0
Future Volume (vph)	270	0	150	0	0	0	0	560	420	300	620	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.172		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3539	1583	324	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			281						467			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	300	0	167	0	0	0	0	622	467	333	689	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	300	0	167	0	0	0	0	622	467	333	689	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effct Green (s)	16.1		16.1					26.0	26.0	75.9	75.9	
Actuated g/C Ratio	0.16		0.16					0.26	0.26	0.76	0.76	
v/c Ratio	0.54		0.34					0.68	0.62	0.36	0.25	
Control Delay	41.7		1.9					37.6	6.9	5.9	0.2	
Queue Delay	0.0		0.0					0.0	0.0	0.0	0.0	
Total Delay	41.7		1.9					37.6	6.9	5.9	0.2	
LOS	D		A					D	A	A	A	
Approach Delay		27.5						24.4			2.1	
Approach LOS		C						C			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 16.1

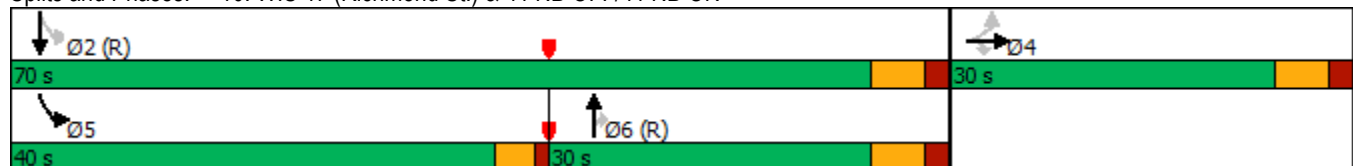
Intersection LOS: B

Intersection Capacity Utilization 67.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	270	0	150	0	0	0	0	560	420	300	620	0
Future Volume (veh/h)	270	0	150	0	0	0	0	560	420	300	620	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	300	0	0				0	622	0	333	689	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1				0	2	2	1	1	0
Cap, veh/h	463	251					0	1375		910	2819	0
Arrive On Green	0.13	0.00	0.00				0.00	0.39	0.00	0.12	0.26	0.00
Sat Flow, veh/h	3483	1885	1598				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	300	0	0				0	622	0	333	689	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1777	1585	1795	1791	0
Q Serve(g_s), s	8.2	0.0	0.0				0.0	13.0	0.0	6.9	15.2	0.0
Cycle Q Clear(g_c), s	8.2	0.0	0.0				0.0	13.0	0.0	6.9	15.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	463	251					0	1375		910	2819	0
V/C Ratio(X)	0.65	0.00					0.00	0.45		0.37	0.24	0.00
Avail Cap(c_a), veh/h	906	490					0	1375		910	2819	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.75	0.75	0.00
Uniform Delay (d), s/veh	41.1	0.0	0.0				0.0	22.8	0.0	9.2	13.5	0.0
Incr Delay (d2), s/veh	1.5	0.0	0.0				0.0	1.1	0.0	0.9	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	0.0	0.0				0.0	5.5	0.0	2.7	7.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.7	0.0	0.0				0.0	23.8	0.0	10.0	13.7	0.0
LnGrp LOS	D	A					A	C		B	B	A
Approach Vol, veh/h	300		A					622	A	1022		
Approach Delay, s/veh	42.7							23.8		12.5		
Approach LOS	D							C		B		
Timer - Assigned Phs	2			4		5	6					
Phs Duration (G+Y+Rc), s	82.7			17.3		40.0	42.7					
Change Period (Y+Rc), s	6.0			6.0		4.0	6.0					
Max Green Setting (Gmax), s	64.0			24.0		36.0	24.0					
Max Q Clear Time (g_c+I1), s	17.2			10.2		8.9	15.0					
Green Ext Time (p_c), s	2.0			1.1		0.8	3.6					
Intersection Summary												
HCM 6th Ctrl Delay	20.8											
HCM 6th LOS	C											

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	280	0	240	380	450	0	0	640	460
Future Volume (vph)	0	0	0	280	0	240	380	450	0	0	640	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.168					
Satd. Flow (perm)	0	0	0	3433	1863	1583	316	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						396						529
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	322	0	276	437	517	0	0	736	529
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	322	0	276	437	517	0	0	736	529
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				17.2		17.2	74.8	74.8			32.0	32.0
Actuated g/C Ratio				0.17		0.17	0.75	0.75			0.32	0.32
v/c Ratio				0.55		0.46	0.54	0.19			0.65	0.61
Control Delay				40.9		2.7	3.4	0.4			32.4	5.7
Queue Delay				0.0		0.0	0.3	0.0			0.0	0.0
Total Delay				40.9		2.7	3.8	0.4			32.4	5.7
LOS				D		A	A	A			C	A
Approach Delay					23.3			1.9			21.3	
Approach LOS					C			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 15.2

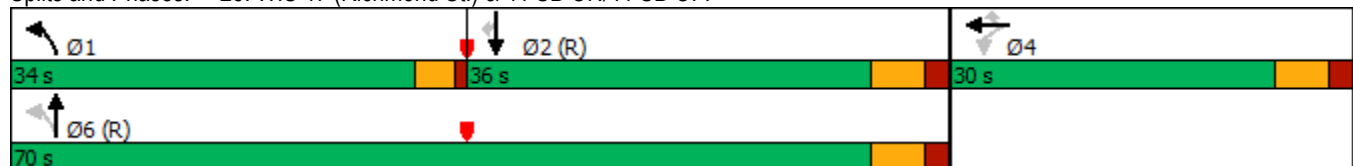
Intersection LOS: B

Intersection Capacity Utilization 67.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary
 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	280	0	240	380	450	0	0	640	460
Future Volume (veh/h)	0	0	0	280	0	240	380	450	0	0	640	460
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				322	0	0	437	517	0	0	736	0
Peak Hour Factor				0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				485	262		809	2793	0	0	1562	
Arrive On Green				0.14	0.00	0.00	0.60	1.00	0.00	0.00	0.44	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				322	0	0	437	517	0	0	736	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				8.8	0.0	0.0	7.1	0.0	0.0	0.0	14.6	0.0
Cycle Q Clear(g_c), s				8.8	0.0	0.0	7.1	0.0	0.0	0.0	14.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				485	262		809	2793	0	0	1562	
V/C Ratio(X)				0.66	0.00		0.54	0.19	0.00	0.00	0.47	
Avail Cap(c_a), veh/h				898	486		809	2793	0	0	1562	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.74	0.74	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				40.7	0.0	0.0	3.7	0.0	0.0	0.0	19.8	0.0
Incr Delay (d2), s/veh				1.6	0.0	0.0	1.9	0.1	0.0	0.0	1.0	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.8	0.0	0.0	1.7	0.0	0.0	0.0	6.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				42.3	0.0	0.0	5.6	0.1	0.0	0.0	20.8	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					322	A		954			736	A
Approach Delay, s/veh					42.3			2.6			20.8	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	48.0		18.0		82.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	9.1	16.6		10.8		2.0						
Green Ext Time (p_c), s	1.0	5.5		1.2		1.4						

Intersection Summary

HCM 6th Ctrl Delay 15.6

HCM 6th LOS B

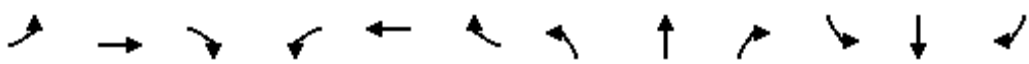
Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	660	160	1030	0	0	870	550
Future Volume (vph)	0	0	0	230	0	660	160	1030	0	0	870	550
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						90						663
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	277	0	795	193	1241	0	0	1048	663
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	277	0	795	193	1241	0	0	1048	663
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				26.0		26.0	66.0	66.0			32.0	32.0
Actuated g/C Ratio				0.26		0.26	0.66	0.66			0.32	0.32
v/c Ratio				0.31		1.66	0.31	0.53			0.93	0.69
Control Delay				30.9		332.8	8.5	1.6			47.6	6.5
Queue Delay				0.0		0.0	0.0	0.5			0.0	0.0
Total Delay				30.9		332.8	8.5	2.1			47.6	6.5
LOS				C		F	A	A			D	A
Approach Delay					254.8			3.0			31.7	
Approach LOS					F			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.66

Intersection Signal Delay: 78.6

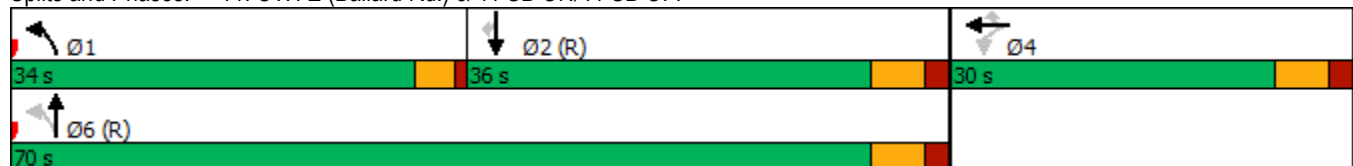
Intersection LOS: E

Intersection Capacity Utilization 88.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	230	0	660	160	1030	0	0	870	550
Future Volume (veh/h)	0	0	0	230	0	660	160	1030	0	0	870	550
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				277	0	0	193	1241	0	0	1048	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				898	486		622	2364	0	0	1137	
Arrive On Green				0.26	0.00	0.00	0.10	0.22	0.00	0.00	0.43	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				277	0	0	193	1241	0	0	1048	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.4	0.0	0.0	5.5	30.6	0.0	0.0	27.9	0.0
Cycle Q Clear(g_c), s				6.4	0.0	0.0	5.5	30.6	0.0	0.0	27.9	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				898	486		622	2364	0	0	1137	
V/C Ratio(X)				0.31	0.00		0.31	0.52	0.00	0.00	0.92	
Avail Cap(c_a), veh/h				898	486		622	2364	0	0	1137	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.49	0.49	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				29.8	0.0	0.0	17.2	25.3	0.0	0.0	27.5	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	0.6	0.4	0.0	0.0	13.5	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.8	0.0	0.0	2.3	14.7	0.0	0.0	12.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.7	0.0	0.0	17.8	25.7	0.0	0.0	41.0	0.0
LnGrp LOS				C	A		B	C	A	A	D	
Approach Vol, veh/h					277	A		1434			1048	A
Approach Delay, s/veh					30.7			24.6			41.0	
Approach LOS					C			C			D	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	36.0		30.0		70.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	7.5	29.9		8.4		32.6						
Green Ext Time (p_c), s	0.4	0.1		1.6		4.2						

Intersection Summary

HCM 6th Ctrl Delay	31.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	540	0	350	0	0	0	0	650	270	810	290	0
Future Volume (vph)	540	0	350	0	0	0	0	650	270	810	290	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850							0.850		
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.140		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3574	1599	263	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			602						307			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	614	0	398	0	0	0	0	739	307	920	330	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	614	0	398	0	0	0	0	739	307	920	330	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	25.0	25.0					31.0	31.0	44.0	75.0	
Total Split (%)	25.0%	25.0%	25.0%					31.0%	31.0%	44.0%	75.0%	
Maximum Green (s)	19.0	19.0	19.0					25.0	25.0	40.0	69.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	21.5		21.5					26.5	26.5	70.5	70.5	
Actuated g/C Ratio	0.22		0.22					0.26	0.26	0.70	0.70	
v/c Ratio	0.83		0.49					0.78	0.47	1.16	0.13	
Control Delay	49.0		2.1					40.7	6.1	95.3	0.1	
Queue Delay	0.0		0.0					0.0	0.0	0.3	0.0	
Total Delay	49.0		2.1					40.7	6.1	95.6	0.1	
LOS	D		A					D	A	F	A	
Approach Delay		30.6						30.5			70.4	
Approach LOS		C						C			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 7 (7%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 45.6

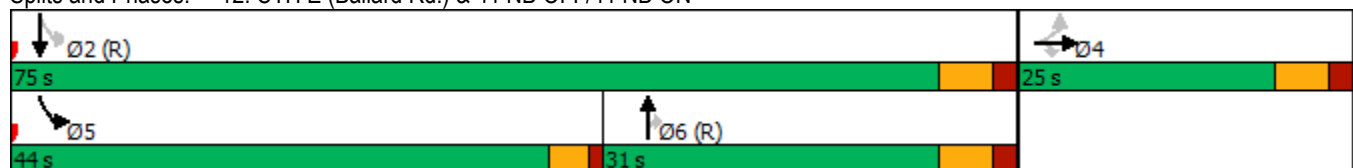
Intersection LOS: D

Intersection Capacity Utilization 88.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	540	0	350	0	0	0	0	650	270	810	290	0
Future Volume (veh/h)	540	0	350	0	0	0	0	650	270	810	290	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	614	0	0				0	739	0	920	330	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	726	393					0	967		854	2543	0
Arrive On Green	0.21	0.00	0.00				0.00	0.54	0.00	0.67	1.00	0.00
Sat Flow, veh/h	3456	1870	1585				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	614	0	0				0	739	0	920	330	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1791	1598	1795	1791	0
Q Serve(g_s), s	17.1	0.0	0.0				0.0	16.2	0.0	40.0	0.0	0.0
Cycle Q Clear(g_c), s	17.1	0.0	0.0				0.0	16.2	0.0	40.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	726	393					0	967		854	2543	0
V/C Ratio(X)	0.85	0.00					0.00	0.76		1.08	0.13	0.00
Avail Cap(c_a), veh/h	726	393					0	967		854	2543	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	1.67	1.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.50	0.50	0.00
Uniform Delay (d), s/veh	37.9	0.0	0.0				0.0	20.5	0.0	8.8	0.0	0.0
Incr Delay (d2), s/veh	11.7	0.0	0.0				0.0	5.7	0.0	45.8	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.3	0.0	0.0				0.0	5.4	0.0	14.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.6	0.0	0.0				0.0	26.2	0.0	54.6	0.1	0.0
LnGrp LOS	D	A					A	C		F	A	A
Approach Vol, veh/h	614		A					739	A	1250		
Approach Delay, s/veh	49.6							26.2		40.2		
Approach LOS	D							C		D		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	75.0			25.0	44.0	31.0						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	69.0			19.0	40.0	25.0						
Max Q Clear Time (g_c+I1), s	2.0			19.1	42.0	18.2						
Green Ext Time (p_c), s	0.9			0.0	0.0	2.8						

Intersection Summary

HCM 6th Ctrl Delay 38.4

HCM 6th LOS D

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↗	↕			↕	↗
Traffic Volume (vph)	0	0	0	120	0	70	320	270	0	0	210	270
Future Volume (vph)	0	0	0	120	0	70	320	270	0	0	210	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3505	1568
Flt Permitted					0.950		0.605					
Satd. Flow (perm)	0	0	0	0	1787	1599	1138	3574	0	0	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						104						303
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	0	0	135	0	79	360	303	0	0	236	303
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	135	79	360	303	0	0	236	303
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					12.6	12.6	37.0	37.0			22.5	22.5
Actuated g/C Ratio					0.22	0.22	0.64	0.64			0.39	0.39
v/c Ratio					0.35	0.18	0.42	0.13			0.17	0.38
Control Delay					21.8	4.3	7.7	4.3			12.1	3.5
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					21.8	4.3	7.7	4.3			12.1	3.5
LOS					C	A	A	A			B	A
Approach Delay					15.3			6.1			7.2	
Approach LOS					B			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 57.6

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 8.0

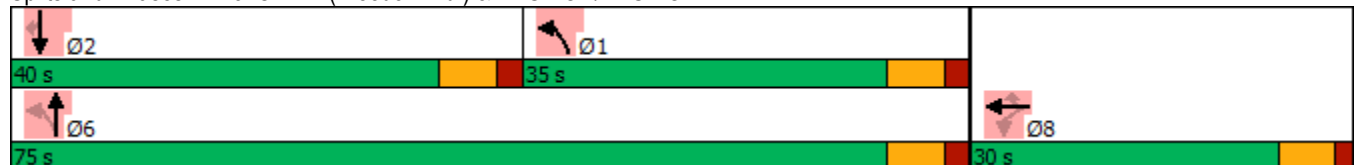
Intersection LOS: A

Intersection Capacity Utilization 52.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↷	↶
Traffic Volume (veh/h)	0	0	0	120	0	70	320	270	0	0	210	270
Future Volume (veh/h)	0	0	0	120	0	70	320	270	0	0	210	270
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1856	1856
Adj Flow Rate, veh/h				135	0	0	360	303	0	0	236	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	3	3
Cap, veh/h				347	0		790	2377	0	0	1422	
Arrive On Green				0.19	0.00	0.00	0.19	0.66	0.00	0.00	0.40	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3618	1572
Grp Volume(v), veh/h				135	0	0	360	303	0	0	236	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1763	1572
Q Serve(g_s), s				3.7	0.0	0.0	0.0	1.7	0.0	0.0	2.4	0.0
Cycle Q Clear(g_c), s				3.7	0.0	0.0	0.0	1.7	0.0	0.0	2.4	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				347	0		790	2377	0	0	1422	
V/C Ratio(X)				0.39	0.00		0.46	0.13	0.00	0.00	0.17	
Avail Cap(c_a), veh/h				837	0		1450	4560	0	0	2276	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				19.6	0.0	0.0	11.5	3.4	0.0	0.0	10.6	0.0
Incr Delay (d2), s/veh				0.7	0.0	0.0	0.6	0.0	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.5	0.0	0.0	2.9	0.4	0.0	0.0	0.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				20.3	0.0	0.0	12.0	3.5	0.0	0.0	10.7	0.0
LnGrp LOS				C	A		B	A	A	A	B	
Approach Vol, veh/h					135	A		663			236	A
Approach Delay, s/veh					20.3			8.1			10.7	
Approach LOS					C			A			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		14.8				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.0	4.4				3.7		5.7				
Green Ext Time (p_c), s	2.4	1.6				1.4		0.4				

Intersection Summary

HCM 6th Ctrl Delay	10.3
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	0	170	0	0	0	0	480	190	80	250	0
Future Volume (vph)	110	0	170	0	0	0	0	480	190	80	250	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1736	1553	0	0	0	0	3471	1553	1736	3471	0
Flt Permitted		0.950								0.423		
Satd. Flow (perm)	0	1736	1553	0	0	0	0	3471	1553	773	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			185						157			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
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 (%)	4%	4%	4%	1%	1%	1%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	120	0	185	0	0	0	0	522	207	87	272	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	120	185	0	0	0	0	522	207	87	272	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

7:00 am Baseline

Synchro 10 Report
Page 6

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effct Green (s)		13.2	13.2					22.9	22.9	36.6	33.8	
Actuated g/C Ratio		0.24	0.24					0.41	0.41	0.66	0.61	
v/c Ratio		0.29	0.36					0.36	0.28	0.12	0.13	
Control Delay		20.8	5.8					13.4	5.5	5.4	4.6	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		20.8	5.8					13.4	5.5	5.4	4.6	
LOS		C	A					B	A	A	A	
Approach Delay		11.7						11.2			4.8	
Approach LOS		B						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 55.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.36

Intersection Signal Delay: 9.7

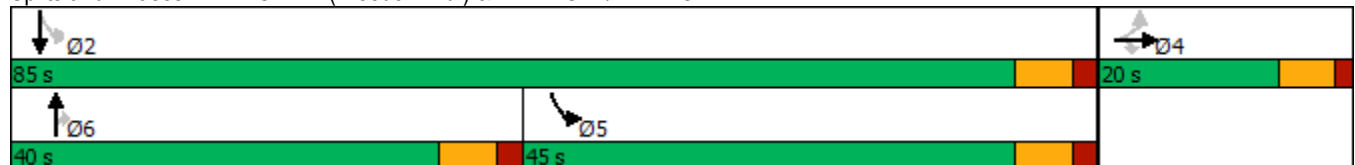
Intersection LOS: A

Intersection Capacity Utilization 52.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	0	170	0	0	0	0	480	190	80	250	0
Future Volume (veh/h)	110	0	170	0	0	0	0	480	190	80	250	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841				0	1841	1841	1841	1841	0
Adj Flow Rate, veh/h	120	0	0				0	522	0	87	272	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4				0	4	4	4	4	0
Cap, veh/h	330	0					0	1421		653	2334	0
Arrive On Green	0.19	0.00	0.00				0.00	0.41	0.00	0.19	0.67	0.00
Sat Flow, veh/h	1753	0	1560				0	3589	1560	1753	3589	0
Grp Volume(v), veh/h	120	0	0				0	522	0	87	272	0
Grp Sat Flow(s),veh/h/ln	1753	0	1560				0	1749	1560	1753	1749	0
Q Serve(g_s), s	3.3	0.0	0.0				0.0	5.8	0.0	0.0	1.6	0.0
Cycle Q Clear(g_c), s	3.3	0.0	0.0				0.0	5.8	0.0	0.0	1.6	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	330	0					0	1421		653	2334	0
V/C Ratio(X)	0.36	0.00					0.00	0.37		0.13	0.12	0.00
Avail Cap(c_a), veh/h	506	0					0	2273		1619	5114	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.6	0.0	0.0				0.0	11.5	0.0	10.7	3.3	0.0
Incr Delay (d2), s/veh	1.0	0.0	0.0				0.0	0.2	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.0				0.0	1.9	0.0	0.6	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	0.0	0.0				0.0	11.6	0.0	10.9	3.3	0.0
LnGrp LOS	C	A					A	B		B	A	A
Approach Vol, veh/h	120		A					522	A	359		
Approach Delay, s/veh	20.6							11.6		5.2		
Approach LOS	C							B		A		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	41.0			14.4	14.5	26.5						
Change Period (Y+Rc), s	6.5			6.0	6.5	6.5						
Max Green Setting (Gmax), s	78.5			14.0	38.5	33.5						
Max Q Clear Time (g_c+I1), s	3.6			5.3	2.0	7.8						
Green Ext Time (p_c), s	1.3			0.3	0.5	2.5						
Intersection Summary												
HCM 6th Ctrl Delay			10.4									
HCM 6th LOS			B									
Notes												

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	100	0	70	70	100	0	0	260	60
Future Volume (vph)	0	0	0	100	0	70	70	100	0	0	260	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.945							0.850
Flt Protected					0.971		0.950					
Satd. Flow (prot)	0	0	0	0	1709	0	1787	1881	0	0	1863	1583
Flt Permitted					0.971		0.950					
Satd. Flow (perm)	0	0	0	0	1709	0	1787	1881	0	0	1863	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
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
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	118	0	82	82	118	0	0	306	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	200	0	82	118	0	0	306	71
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	37.4%											
Analysis Period (min)	15											
	ICU Level of Service A											

Intersection												
Int Delay, s/veh	4.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕		↕	↑			↑	↗
Traffic Vol, veh/h	0	0	0	100	0	70	70	100	0	0	260	60
Future Vol, veh/h	0	0	0	100	0	70	70	100	0	0	260	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	2	2	2
Mvmt Flow	0	0	0	118	0	82	82	118	0	0	306	71
Major/Minor												
Minor1				Major1				Major2				
Conflicting Flow All	624	659	118	377	0	-	-	-	-	-	0	
Stage 1	282	282	-	-	-	-	-	-	-	-	-	
Stage 2	342	377	-	-	-	-	-	-	-	-	-	
Critical Hdwy	6.42	6.52	6.22	4.11	-	-	-	-	-	-	-	
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-	-	-	
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-	-	-	
Follow-up Hdwy	3.518	4.018	3.318	2.209	-	-	-	-	-	-	-	
Pot Cap-1 Maneuver	449	384	934	1187	-	0	0	-	-	-	-	
Stage 1	766	678	-	-	-	0	0	-	-	-	-	
Stage 2	719	616	-	-	-	0	0	-	-	-	-	
Platoon blocked, %					-			-		-		
Mov Cap-1 Maneuver	418	0	934	1187	-	-	-	-	-	-	-	
Mov Cap-2 Maneuver	418	0	-	-	-	-	-	-	-	-	-	
Stage 1	713	0	-	-	-	-	-	-	-	-	-	
Stage 2	719	0	-	-	-	-	-	-	-	-	-	
Approach												
WB				NB				SB				
HCM Control Delay, s	15.5			3.4				0				
HCM LOS	C											
Minor Lane/Major Mvmt												
NBL				NBTWBLn1				SBT SBR				
Capacity (veh/h)	1187	-	541	-	-	-	-					
HCM Lane V/C Ratio	0.069	-	0.37	-	-	-	-					
HCM Control Delay (s)	8.3	-	15.5	-	-	-	-					
HCM Lane LOS	A	-	C	-	-	-	-					
HCM 95th %tile Q(veh)	0.2	-	1.7	-	-	-	-					

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	0	70	0	0	0	0	130	250	60	300	0
Future Volume (vph)	40	0	70	0	0	0	0	130	250	60	300	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.914							0.850			
Flt Protected		0.982								0.950		
Satd. Flow (prot)	0	1624	0	0	0	0	0	1863	1583	1787	1881	0
Flt Permitted		0.982								0.950		
Satd. Flow (perm)	0	1624	0	0	0	0	0	1863	1583	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	45	0	80	0	0	0	0	148	284	68	341	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	125	0	0	0	0	0	148	284	68	341	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	37.4%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕						↑	↗	↘	↑	
Traffic Vol, veh/h	40	0	70	0	0	0	0	130	250	60	300	0
Future Vol, veh/h	40	0	70	0	0	0	0	130	250	60	300	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	2	2	2	1	1	1
Mvmt Flow	45	0	80	0	0	0	0	148	284	68	341	0
Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	767	909	341				-	0	0	432	0	0
Stage 1	477	477	-				-	-	-	-	-	-
Stage 2	290	432	-				-	-	-	-	-	-
Critical Hdwy	6.45	6.55	6.25				-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.45	5.55	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-				-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345				-	-	-	2.209	-	-
Pot Cap-1 Maneuver	366	272	695				0	-	-	1133	-	0
Stage 1	618	551	-				0	-	-	-	-	0
Stage 2	753	577	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	344	0	695				-	-	-	1133	-	-
Mov Cap-2 Maneuver	344	0	-				-	-	-	-	-	-
Stage 1	581	0	-				-	-	-	-	-	-
Stage 2	753	0	-				-	-	-	-	-	-
Approach	EB						NB			SB		
HCM Control Delay, s	14.4						0			1.4		
HCM LOS	B											
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	SBL	SBT						
Capacity (veh/h)		-	-	507	1133	-						
HCM Lane V/C Ratio		-	-	0.247	0.06	-						
HCM Control Delay (s)		-	-	14.4	8.4	-						
HCM Lane LOS		-	-	B	A	-						
HCM 95th %tile Q(veh)		-	-	1	0.2	-						

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	350	90	150	130	0	0	0	0	60	0	120
Future Volume (vph)	0	350	90	150	130	0	0	0	0	60	0	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	412	106	176	153	0	0	0	0	71	0	141
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	412	106	176	153	0	0	0	0	0	71	141
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	41.5%				ICU Level of Service A							
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↘	↑						↑	↗
Traffic Vol, veh/h	0	350	90	150	130	0	0	0	0	60	0	120
Future Vol, veh/h	0	350	90	150	130	0	0	0	0	60	0	120
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	412	106	176	153	0	0	0	0	71	0	141
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	518	0	0				970	1023	153
Stage 1	-	-	-	-	-	-				505	505	-
Stage 2	-	-	-	-	-	-				465	518	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1053	-	0				281	236	893
Stage 1	0	-	-	-	-	0				606	540	-
Stage 2	0	-	-	-	-	0				632	533	-
Platoon blocked, %	-	-	-	-	-	-				-	-	-
Mov Cap-1 Maneuver	-	-	-	1053	-	-				234	0	893
Mov Cap-2 Maneuver	-	-	-	-	-	-				234	0	-
Stage 1	-	-	-	-	-	-				505	0	-
Stage 2	-	-	-	-	-	-				632	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			4.9			15.5					
HCM LOS							C					
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1053	-	234	893						
HCM Lane V/C Ratio	-	-	0.168	-	0.302	0.158						
HCM Control Delay (s)	-	-	9.1	-	26.9	9.8						
HCM Lane LOS	-	-	A	-	D	A						
HCM 95th %tile Q(veh)	-	-	0.6	-	1.2	0.6						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	120	0	0	230	130	50	0	100	0	0	0
Future Volume (vph)	290	120	0	0	230	130	50	0	100	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	330	136	0	0	261	148	57	0	114	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	330	136	0	0	261	148	0	57	114	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	41.5%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	6.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	290	120	0	0	230	130	50	0	100	0	0	0
Future Vol, veh/h	290	120	0	0	230	130	50	0	100	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	330	136	0	0	261	148	57	0	114	0	0	0
Major/Minor	Major1			Major2			Minor1					
Conflicting Flow All	409	0	-	-	-	-	0	1131	1205	136		
Stage 1	-	-	-	-	-	-	-	796	796	-		
Stage 2	-	-	-	-	-	-	-	335	409	-		
Critical Hdwy	4.11	-	-	-	-	-	-	6.45	6.55	6.25		
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.45	5.55	-		
Critical Hdwy Stg 2	-	-	-	-	-	-	-	5.45	5.55	-		
Follow-up Hdwy	2.209	-	-	-	-	-	-	3.545	4.045	3.345		
Pot Cap-1 Maneuver	1155	-	0	0	-	-	-	222	181	905		
Stage 1	-	-	0	0	-	-	-	439	395	-		
Stage 2	-	-	0	0	-	-	-	718	591	-		
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-		
Mov Cap-1 Maneuver	1155	-	-	-	-	-	-	159	0	905		
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	159	0	-		
Stage 1	-	-	-	-	-	-	-	313	0	-		
Stage 2	-	-	-	-	-	-	-	718	0	-		
Approach	EB			WB			NB					
HCM Control Delay, s	6.6			0			19.6					
HCM LOS							C					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR						
Capacity (veh/h)	159	905	1155	-	-	-						
HCM Lane V/C Ratio	0.357	0.126	0.285	-	-	-						
HCM Control Delay (s)	39.7	9.5	9.4	-	-	-						
HCM Lane LOS	E	A	A	-	-	-						
HCM 95th %tile Q(veh)	1.5	0.4	1.2	-	-	-						

APPENDIX O5

Year 2028 No Build with Retimings Synchro PM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	830	410	330	380	0	0	0	0	180	0	310
Future Volume (vph)	0	830	410	330	380	0	0	0	0	180	0	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1827	1553	1719	1810	0	0	0	0	0	1787	1599
Flt Permitted				0.097							0.950	
Satd. Flow (perm)	0	1827	1553	176	1810	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			311									373
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1000	494	398	458	0	0	0	0	217	0	373
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1000	494	398	458	0	0	0	0	0	217	373
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

5:00 pm Baseline

%user_name%

Synchro 7 - Report

Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		41.0	41.0	25.0	66.0					34.0	34.0	34.0
Total Split (%)		41.0%	41.0%	25.0%	66.0%					34.0%	34.0%	34.0%
Maximum Green (s)		34.5	34.5	18.5	59.5					28.0	28.0	28.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effct Green (s)		37.1	37.1	62.0	62.0						18.3	18.3
Actuated g/C Ratio		0.42	0.42	0.70	0.70						0.21	0.21
v/c Ratio		1.30	0.59	0.82	0.36						0.59	0.60
Control Delay		171.8	10.9	42.1	7.0						38.1	7.5
Queue Delay		0.0	0.0	0.0	0.7						0.0	0.0
Total Delay		171.8	10.9	42.1	7.7						38.1	7.5
LOS		F	B	D	A						D	A
Approach Delay		118.6			23.7						18.8	
Approach LOS		F			C						B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 88.3

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.30

Intersection Signal Delay: 70.9

Intersection LOS: E

Intersection Capacity Utilization 81.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

 Ø2	 Ø4
66 s	34 s
 Ø6	 Ø5
41 s	25 s

HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↕	↗
Traffic Volume (veh/h)	0	830	410	330	380	0	0	0	0	180	0	310
Future Volume (veh/h)	0	830	410	330	380	0	0	0	0	180	0	310
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1826	1826	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1000	494	398	458	0				217	0	373
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	4	4	5	5	0				1	1	1
Cap, veh/h	0	705	598	453	1173	0				494	0	439
Arrive On Green	0.00	0.38	0.38	0.22	0.64	0.00				0.27	0.00	0.27
Sat Flow, veh/h	0	1841	1560	1739	1826	0				1795	0	1598
Grp Volume(v), veh/h	0	1000	494	398	458	0				217	0	373
Grp Sat Flow(s),veh/h/ln	0	1841	1560	1739	1826	0				1795	0	1598
Q Serve(g_s), s	0.0	37.0	27.6	17.1	11.6	0.0				9.6	0.0	21.3
Cycle Q Clear(g_c), s	0.0	37.0	27.6	17.1	11.6	0.0				9.6	0.0	21.3
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	705	598	453	1173	0				494	0	439
V/C Ratio(X)	0.00	1.42	0.83	0.88	0.39	0.00				0.44	0.00	0.85
Avail Cap(c_a), veh/h	0	705	598	453	1173	0				558	0	496
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	29.8	26.9	34.6	8.2	0.0				28.9	0.0	33.1
Incr Delay (d2), s/veh	0.0	196.2	9.7	17.7	0.3	0.0				0.6	0.0	12.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	54.1	11.5	11.0	4.2	0.0				4.2	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	225.9	36.5	52.3	8.6	0.0				29.5	0.0	45.1
LnGrp LOS	A	F	D	D	A	A				C	A	D
Approach Vol, veh/h		1494			856						590	
Approach Delay, s/veh		163.3			28.9						39.3	
Approach LOS		F			C						D	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		66.0		30.5	25.0	41.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		59.5		28.0	18.5	34.5						
Max Q Clear Time (g_c+I1), s		13.6		23.3	19.1	39.0						
Green Ext Time (p_c), s		3.4		1.2	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			99.3									
HCM 6th LOS			F									

Lanes, Volumes, Timings
2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	630	380	710	160	0	0
Future Volume (vph)	630	380	710	160	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr t				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1845	1568	0	0
Flt Permitted	0.168					
Satd. Flow (perm)	313	1863	1845	1568	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				165		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	3%	3%	1%	1%
Adj. Flow (vph)	649	392	732	165	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	649	392	732	165	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0		
Minimum Split (s)	13.5	26.5	26.5	26.5		

Lanes, Volumes, Timings
2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



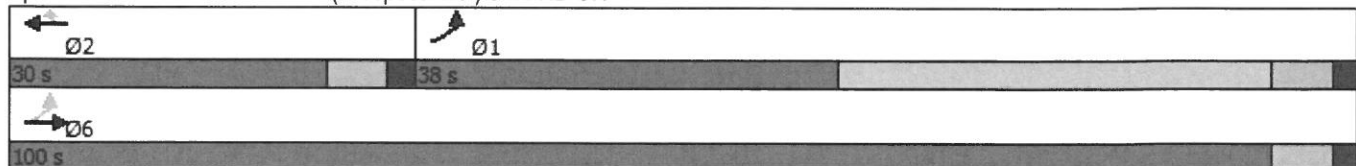
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effct Green (s)	53.2	57.3	26.4	26.4		
Actuated g/C Ratio	0.93	1.00	0.46	0.46		
v/c Ratio	0.75	0.21	0.86	0.20		
Control Delay	14.2	0.3	30.0	3.4		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	14.2	0.3	30.0	3.4		
LOS	B	A	C	A		
Approach Delay		9.0	25.1			
Approach LOS		A	C			

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 57.3
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 16.4
Intersection Capacity Utilization 81.9%
Analysis Period (min) 15

Intersection LOS: B
ICU Level of Service D

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	630	380	710	160	0	0
Future Volume (veh/h)	630	380	710	160	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856		
Adj Flow Rate, veh/h	649	392	732	165		
Peak Hour Factor	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	3	3		
Cap, veh/h	819	1721	887	751		
Arrive On Green	0.36	0.92	0.48	0.48		
Sat Flow, veh/h	1781	1870	1856	1572		
Grp Volume(v), veh/h	649	392	732	165		
Grp Sat Flow(s),veh/h/ln	1781	1870	1856	1572		
Q Serve(g_s), s	10.6	1.1	17.0	3.1		
Cycle Q Clear(g_c), s	10.6	1.1	17.0	3.1		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	819	1721	887	751		
V/C Ratio(X)	0.79	0.23	0.83	0.22		
Avail Cap(c_a), veh/h	1383	3585	963	816		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	12.1	0.2	11.3	7.6		
Incr Delay (d2), s/veh	1.8	0.1	6.0	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	5.1	0.0	6.8	0.8		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.9	0.3	17.2	7.8		
LnGrp LOS	B	A	B	A		
Approach Vol, veh/h		1041	897			
Approach Delay, s/veh		8.8	15.5			
Approach LOS		A	B			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	22.2	27.9			50.1	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	12.6	19.0			3.1	
Green Ext Time (p_c), s	3.0	2.4			2.8	
Intersection Summary						
HCM 6th Ctrl Delay			11.9			
HCM 6th LOS			B			

Lanes, Volumes, Timings

3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	380	0	0	670	200	400
Future Volume (vph)	380	0	0	670	200	400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1845	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1845	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						382
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Adj. Flow (vph)	447	0	0	788	235	471
Shared Lane Traffic (%)						
Lane Group Flow (vph)	447	0	0	788	235	471
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

Lanes, Volumes, Timings
 3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Act Effct Green (s)	35.6			35.6	18.3	18.3
Actuated g/C Ratio	0.57			0.57	0.29	0.29
v/c Ratio	0.42			0.75	0.45	0.64
Control Delay	9.3			15.9	23.6	9.7
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.3			15.9	23.6	9.7
LOS	A			B	C	A
Approach Delay	9.3			15.9	14.3	
Approach LOS	A			B	B	

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 62.5
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.75
 Intersection Signal Delay: 13.8
 Intersection Capacity Utilization 53.0%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)

← Ø2	↖ Ø4
59 s	41 s
→ Ø6	
59 s	

HCM 6th Signalized Intersection Summary 3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	380	0	0	670	200	400
Future Volume (veh/h)	380	0	0	670	200	400
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1856	1870	1870
Adj Flow Rate, veh/h	447	0	0	788	235	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	0	3	2	2
Cap, veh/h	1060	0	0	1052	454	
Arrive On Green	0.57	0.00	0.00	0.57	0.26	0.00
Sat Flow, veh/h	1870	0	0	1856	1781	1585
Grp Volume(v), veh/h	447	0	0	788	235	0
Grp Sat Flow(s),veh/h/ln	1870	0	0	1856	1781	1585
Q Serve(g_s), s	6.1	0.0	0.0	14.4	5.1	0.0
Cycle Q Clear(g_c), s	6.1	0.0	0.0	14.4	5.1	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1060	0	0	1052	454	
V/C Ratio(X)	0.42	0.00	0.00	0.75	0.52	
Avail Cap(c_a), veh/h	2288	0	0	2270	1466	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.5	0.0	0.0	7.3	14.4	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.6	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	0.0	3.9	1.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.9	0.0	0.0	8.9	15.3	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	447			788	235	A
Approach Delay, s/veh	5.9			8.9	15.3	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	29.5		15.5		29.5	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+l1), s	16.4		7.1		8.1	
Green Ext Time (p_c), s	7.1		0.9		3.2	

Intersection Summary

HCM 6th Ctrl Delay	9.0
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	1380	600	440	1450	0	0	0	0	190	0	210
Future Volume (vph)	0	1380	600	440	1450	0	0	0	0	190	0	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0		0	450		450
Storage Lanes	0		1	1		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			497									121
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	1438	625	458	1510	0	0	0	0	198	0	219
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	1438	625	458	1510	0	0	0	0	0	198	219
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	4.0	5.0					5.0	5.0	5.0
Minimum Split (s)		9.0	9.0	10.0	10.0					11.0	11.0	11.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	72.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	1.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-1.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.88	0.74	0.69	0.58					0.63	0.35	0.35
Control Delay		40.1	12.5	45.2	9.0					47.1	17.7	17.7
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		40.1	12.5	45.2	9.0					47.1	17.7	17.7
LOS		D	B	D	A					D	B	B
Approach Delay		31.7			17.4					31.6		
Approach LOS		C			B					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 25.4

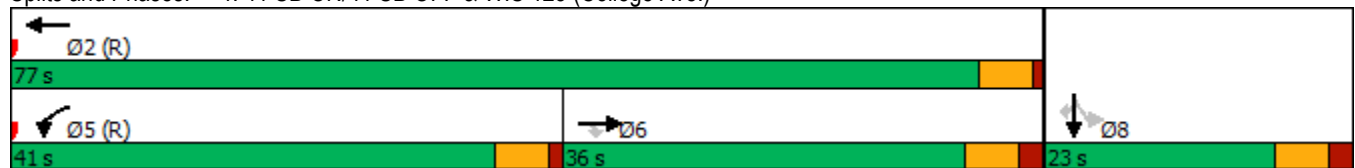
Intersection LOS: C

Intersection Capacity Utilization 81.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	1380	600	440	1450	0	0	0	0	190	0	210
Future Volume (veh/h)	0	1380	600	440	1450	0	0	0	0	190	0	210
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1856	1856	1856
Adj Flow Rate, veh/h	0	1438	0	458	1510	0				198	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	1	1	0				3	3	3
Cap, veh/h	0	2496		971	3797	0				672	0	
Arrive On Green	0.00	0.16	0.00	0.54	1.00	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1795	3676	0				3534	0	3145
Grp Volume(v), veh/h	0	1438	0	458	1510	0				198	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1795	1791	0				1767	0	1572
Q Serve(g_s), s	0.0	26.0	0.0	15.7	0.0	0.0				4.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	26.0	0.0	15.7	0.0	0.0				4.8	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2496		971	3797	0				672	0	
V/C Ratio(X)	0.00	0.58		0.47	0.40	0.00				0.29	0.00	
Avail Cap(c_a), veh/h	0	2496		971	3797	0				672	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.21	0.21	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	32.3	0.0	14.1	0.0	0.0				34.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.1	0.1	0.0				1.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	12.1	0.0	6.1	0.0	0.0				2.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	33.3	0.0	14.2	0.1	0.0				35.9	0.0	0.0
LnGrp LOS	A	C		B	A	A				D	A	
Approach Vol, veh/h		1438	A		1968						198	A
Approach Delay, s/veh		33.3			3.4						35.9	
Approach LOS		C			A						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		112.0			58.9	53.1		23.0				
Change Period (Y+Rc), s		* 6			5.0	6.0		6.0				
Max Green Setting (Gmax), s		* 72			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		2.0			17.7	28.0		6.8				
Green Ext Time (p_c), s		11.6			1.9	1.4		0.6				
Intersection Summary												
HCM 6th Ctrl Delay			17.1									
HCM 6th LOS			B									
Notes												
User approved volume balancing among the lanes for turning movement.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	1010	0	0	1380	290	510	0	490	0	0	0
Future Volume (vph)	560	1010	0	0	1380	290	510	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.114						0.950					
Satd. Flow (perm)	214	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						299			216			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	577	1041	0	0	1423	299	526	0	505	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	577	1041	0	0	1423	299	526	0	505	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	32.0	67.0			35.0	35.0	33.0	33.0	33.0			
Total Split (%)	32.0%	67.0%			35.0%	35.0%	33.0%	33.0%	33.0%			
Maximum Green (s)	26.0	61.0			29.0	29.0	28.0	28.0	28.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	63.0	63.0			31.0	31.0	29.0		29.0			
Actuated g/C Ratio	0.63	0.63			0.31	0.31	0.29		0.29			
v/c Ratio	1.00	0.46			0.90	0.43	1.08		0.53			
Control Delay	69.1	26.7			42.4	5.2	99.5		18.7			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	69.1	26.7			42.4	5.2	99.5		18.7			
LOS	E	C			D	A	F		B			
Approach Delay	41.8				35.9		59.9					
Approach LOS	D				D		E					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 43.7

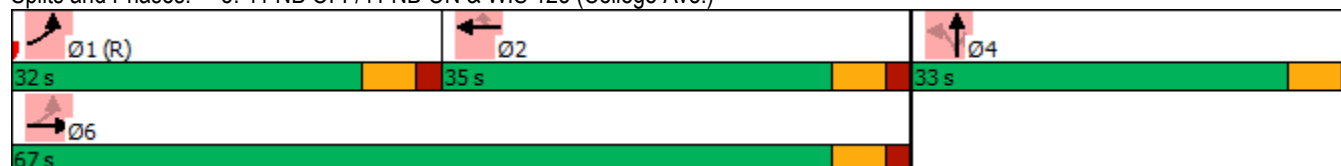
Intersection LOS: D

Intersection Capacity Utilization 81.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (veh/h)	560	1010	0	0	1380	290	510	0	490	0	0	0
Future Volume (veh/h)	560	1010	0	0	1380	290	510	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	577	1041	0	0	1423	0	526	0	0			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	588	2257	0	0	1583		1033	0				
Arrive On Green	0.28	0.63	0.00	0.00	0.10	0.00	0.29	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	577	1041	0	0	1423	0	526	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	27.1	15.2	0.0	0.0	27.6	0.0	12.3	0.0	0.0			
Cycle Q Clear(g_c), s	27.1	15.2	0.0	0.0	27.6	0.0	12.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	588	2257	0	0	1583		1033	0				
V/C Ratio(X)	0.98	0.46	0.00	0.00	0.90		0.51	0.00				
Avail Cap(c_a), veh/h	588	2257	0	0	1583		1033	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.35	0.35	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	27.9	9.6	0.0	0.0	43.3	0.0	29.6	0.0	0.0			
Incr Delay (d2), s/veh	17.7	0.2	0.0	0.0	8.5	0.0	1.8	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	11.0	5.5	0.0	0.0	13.8	0.0	5.4	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.6	9.9	0.0	0.0	51.9	0.0	31.4	0.0	0.0			
LnGrp LOS	D	A	A	A	D		C	A				
Approach Vol, veh/h	1618			1423			526			A		
Approach Delay, s/veh	22.6			51.9			31.4					
Approach LOS	C			D			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	32.0	35.0		33.0		67.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	26.0	29.0		28.0		61.0						
Max Q Clear Time (g_c+I1), s	29.1	29.6		14.3		17.2						
Green Ext Time (p_c), s	0.0	0.0		2.2		6.2						

Intersection Summary

HCM 6th Ctrl Delay	35.6
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	1580	420	600	1620	0	0	0	0	220	0	500
Future Volume (vph)	0	1580	420	600	1620	0	0	0	0	220	0	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1787	1599
Flt Permitted				0.125							0.950	
Satd. Flow (perm)	0	5085	1583	233	3539	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			429									76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1612	429	612	1653	0	0	0	0	224	0	510
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1612	429	612	1653	0	0	0	0	0	224	510
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	70.0	70.0						22.0	22.0
Actuated g/C Ratio		0.30	0.30	0.70	0.70						0.22	0.22
v/c Ratio		1.06	0.55	0.85	0.67						0.57	1.24
Control Delay		74.5	5.7	7.5	4.8						41.4	157.9
Queue Delay		17.8	0.0	50.0	48.8						0.0	0.0
Total Delay		92.4	5.7	57.5	53.6						41.4	157.9
LOS		F	A	E	D						D	F
Approach Delay		74.2			54.7						122.3	
Approach LOS		E			D						F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 72.4

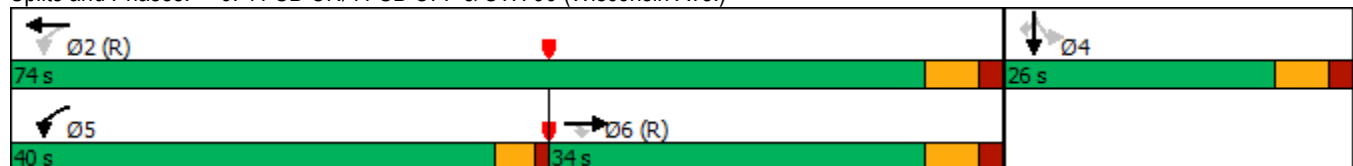
Intersection LOS: E

Intersection Capacity Utilization 96.9%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (veh/h)	0	1580	420	600	1620	0	0	0	0	220	0	500
Future Volume (veh/h)	0	1580	420	600	1620	0	0	0	0	220	0	500
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1612	0	612	1653	0				224	0	510
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1532		713	2488	0				395	0	351
Arrive On Green	0.00	0.30	0.00	0.36	0.70	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1795	0	1598
Grp Volume(v), veh/h	0	1612	0	612	1653	0				224	0	510
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1795	0	1598
Q Serve(g_s), s	0.0	30.0	0.0	27.3	26.1	0.0				11.1	0.0	22.0
Cycle Q Clear(g_c), s	0.0	30.0	0.0	27.3	26.1	0.0				11.1	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		713	2488	0				395	0	351
V/C Ratio(X)	0.00	1.05		0.86	0.66	0.00				0.57	0.00	1.45
Avail Cap(c_a), veh/h	0	1532		713	2488	0				395	0	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	35.0	0.0	23.6	8.4	0.0				34.8	0.0	39.0
Incr Delay (d2), s/veh	0.0	38.1	0.0	1.3	0.1	0.0				1.9	0.0	218.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	17.5	0.0	13.1	8.4	0.0				5.0	0.0	38.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	73.1	0.0	25.0	8.5	0.0				36.7	0.0	257.3
LnGrp LOS	A	F		C	A	A				D	A	F
Approach Vol, veh/h		1612	A		2265						734	
Approach Delay, s/veh		73.1			13.0						190.0	
Approach LOS		E			B						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		28.1		24.0	29.3	32.0						
Green Ext Time (p_c), s		19.8		0.0	1.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			62.2									
HCM 6th LOS			E									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	730	1070	0	0	1800	310	420	0	490	0	0	0
Future Volume (vph)	730	1070	0	0	1800	310	420	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.125						0.950					
Satd. Flow (perm)	233	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						316			140			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	745	1092	0	0	1837	316	429	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	745	1092	0	0	1837	316	429	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	1.04	0.44			1.20	0.45	1.16		1.09			
Control Delay	38.7	2.3			131.1	5.4	135.6		98.2			
Queue Delay	24.0	7.2			0.5	0.0	0.0		0.0			
Total Delay	62.6	9.5			131.6	5.4	135.6		98.2			
LOS	E	A			F	A	F		F			
Approach Delay	31.0				113.1		115.4					
Approach LOS	C				F		F					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.20

Intersection Signal Delay: 82.9

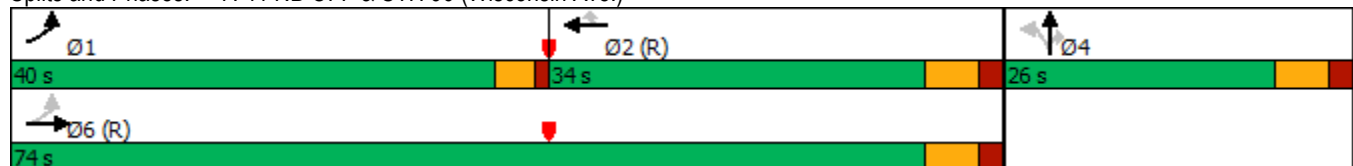
Intersection LOS: F

Intersection Capacity Utilization 96.9%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	730	1070	0	0	1800	310	420	0	490	0	0	0
Future Volume (veh/h)	730	1070	0	0	1800	310	420	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No				No				No			
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	745	1092	0	0	1837	316	429	0	0			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	713	2681	0	0	1810	562	590	0				
Arrive On Green	0.12	0.25	0.00	0.00	0.35	0.35	0.17	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	745	1092	0	0	1837	316	429	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	36.0	25.7	0.0	0.0	35.4	16.1	11.4	0.0	0.0			
Cycle Q Clear(g_c), s	36.0	25.7	0.0	0.0	35.4	16.1	11.4	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	713	2681	0	0	1810	562	590	0				
V/C Ratio(X)	1.04	0.41	0.00	0.00	1.02	0.56	0.73	0.00				
Avail Cap(c_a), veh/h	713	2681	0	0	1810	562	784	0				
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	39.4	18.9	0.0	0.0	32.3	26.0	39.6	0.0	0.0			
Incr Delay (d2), s/veh	24.4	0.0	0.0	0.0	25.0	4.0	2.3	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	23.9	12.1	0.0	0.0	18.2	6.6	5.1	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.8	18.9	0.0	0.0	57.3	30.1	41.9	0.0	0.0			
LnGrp LOS	F	B	A	A	F	C	D	A				
Approach Vol, veh/h	1837				2153				429			
Approach Delay, s/veh	37.1				53.3				41.9			
Approach LOS	D				D				D			
Timer - Assigned Phs	1	2	4				6					
Phs Duration (G+Y+Rc), s	40.0	39.4	20.6				79.4					
Change Period (Y+Rc), s	4.0	6.0	6.0				6.0					
Max Green Setting (Gmax), s	36.0	28.0	20.0				68.0					
Max Q Clear Time (g_c+I1), s	38.0	37.4	13.4				27.7					
Green Ext Time (p_c), s	0.0	0.0	1.1				10.5					

Intersection Summary

HCM 6th Ctrl Delay	45.4
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	480	0	260	0	0	0	0	920	510	300	1060	0
Future Volume (vph)	480	0	260	0	0	0	0	920	510	300	1060	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.143		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3539	1583	269	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			111						548			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	516	0	280	0	0	0	0	989	548	323	1140	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	516	0	280	0	0	0	0	989	548	323	1140	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effct Green (s)	22.6		22.6					26.0	26.0	69.4	69.4	
Actuated g/C Ratio	0.23		0.23					0.26	0.26	0.69	0.69	
v/c Ratio	0.67		0.63					1.07	0.67	0.41	0.46	
Control Delay	39.4		27.0					88.3	7.3	10.5	0.4	
Queue Delay	0.2		0.0					0.0	0.0	0.0	0.2	
Total Delay	39.6		27.0					88.3	7.3	10.5	0.6	
LOS	D		C					F	A	B	A	
Approach Delay		35.2						59.5			2.8	
Approach LOS		D						E			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 32.5

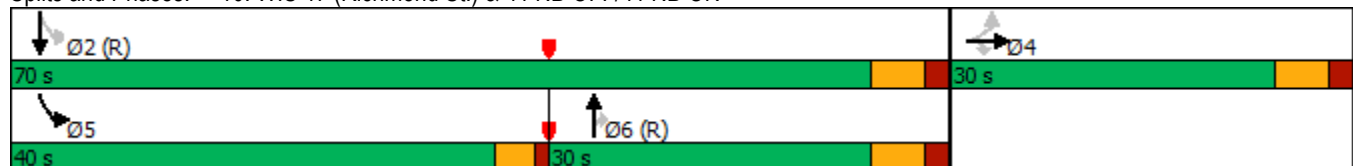
Intersection LOS: C

Intersection Capacity Utilization 71.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	480	0	260	0	0	0	0	920	510	300	1060	0
Future Volume (veh/h)	480	0	260	0	0	0	0	920	510	300	1060	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	516	0	0				0	989	0	323	1140	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2				0	2	2	1	1	0
Cap, veh/h	680	368					0	1148		743	2590	0
Arrive On Green	0.20	0.00	0.00				0.00	0.32	0.00	0.24	0.48	0.00
Sat Flow, veh/h	3456	1870	1585				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	516	0	0				0	989	0	323	1140	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1777	1585	1795	1791	0
Q Serve(g_s), s	14.1	0.0	0.0				0.0	26.1	0.0	9.4	20.9	0.0
Cycle Q Clear(g_c), s	14.1	0.0	0.0				0.0	26.1	0.0	9.4	20.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	680	368					0	1148		743	2590	0
V/C Ratio(X)	0.76	0.00					0.00	0.86		0.44	0.44	0.00
Avail Cap(c_a), veh/h	898	486					0	1148		743	2590	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.54	0.54	0.00
Uniform Delay (d), s/veh	37.9	0.0	0.0				0.0	31.7	0.0	16.9	12.5	0.0
Incr Delay (d2), s/veh	2.7	0.0	0.0				0.0	8.6	0.0	1.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.1	0.0	0.0				0.0	12.3	0.0	4.1	9.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.6	0.0	0.0				0.0	40.3	0.0	17.9	12.8	0.0
LnGrp LOS	D	A					A	D		B	B	A
Approach Vol, veh/h	516		A					989	A	1463		
Approach Delay, s/veh	40.6							40.3		13.9		
Approach LOS	D							D		B		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	76.3			23.7	40.0	36.3						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	64.0			24.0	36.0	24.0						
Max Q Clear Time (g_c+I1), s	22.9			16.1	11.4	28.1						
Green Ext Time (p_c), s	3.8			1.6	0.7	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			27.4									
HCM 6th LOS			C									
Notes												

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	520	0	290	230	1170	0	0	840	310
Future Volume (vph)	0	0	0	520	0	290	230	1170	0	0	840	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						82						341
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	571	0	319	253	1286	0	0	923	341
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	571	0	319	253	1286	0	0	923	341
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

5:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				23.6		23.6	68.4	68.4			32.0	32.0
Actuated g/C Ratio				0.24		0.24	0.68	0.68			0.32	0.32
v/c Ratio				0.70		0.73	0.38	0.53			0.82	0.46
Control Delay				39.9		36.2	3.2	4.3			38.3	5.1
Queue Delay				0.0		0.0	0.0	0.9			0.0	0.0
Total Delay				39.9		36.2	3.2	5.2			38.3	5.1
LOS				D		D	A	A			D	A
Approach Delay					38.5			4.9			29.3	
Approach LOS					D			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 21.4

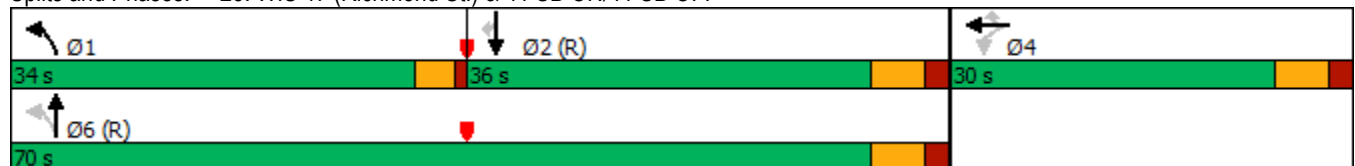
Intersection LOS: C

Intersection Capacity Utilization 71.9%

ICU Level of Service C

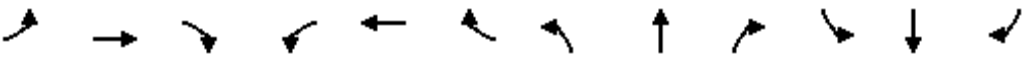
Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	520	0	290	230	1170	0	0	840	310
Future Volume (veh/h)	0	0	0	520	0	290	230	1170	0	0	840	310
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				571	0	0	253	1286	0	0	923	0
Peak Hour Factor				0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				731	396		688	2537	0	0	1309	
Arrive On Green				0.21	0.00	0.00	0.40	0.94	0.00	0.00	0.37	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				571	0	0	253	1286	0	0	923	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				15.6	0.0	0.0	4.9	4.0	0.0	0.0	22.2	0.0
Cycle Q Clear(g_c), s				15.6	0.0	0.0	4.9	4.0	0.0	0.0	22.2	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				731	396		688	2537	0	0	1309	
V/C Ratio(X)				0.78	0.00		0.37	0.51	0.00	0.00	0.71	
Avail Cap(c_a), veh/h				898	486		688	2537	0	0	1309	
HCM Platoon Ratio				1.00	1.00	1.00	1.33	1.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.24	0.24	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				37.2	0.0	0.0	9.3	1.0	0.0	0.0	26.9	0.0
Incr Delay (d2), s/veh				3.6	0.0	0.0	0.4	0.2	0.0	0.0	3.2	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				6.9	0.0	0.0	1.6	0.8	0.0	0.0	9.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				40.9	0.0	0.0	9.7	1.1	0.0	0.0	30.2	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					571	A		1539			923	A
Approach Delay, s/veh					40.9			2.5			30.2	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	40.8		25.2		74.8						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	6.9	24.2		17.6		6.0						
Green Ext Time (p_c), s	0.5	3.6		1.6		4.5						

Intersection Summary

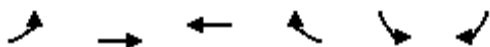
HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019



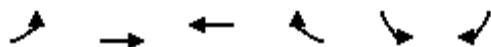
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	230	1700	1170	480	160	890
Future Volume (vph)	230	1700	1170	480	160	890
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3574	1599	1752	1568
Flt Permitted	0.080				0.950	
Satd. Flow (perm)	149	3539	3574	1599	1752	1568
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				545		189
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	261	1932	1330	545	182	1011
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	1932	1330	545	182	1011
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	13.0	64.0	51.0	51.0	31.0	31.0
Total Split (%)	13.7%	67.4%	53.7%	53.7%	32.6%	32.6%
Maximum Green (s)	8.0	58.0	45.0	45.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	59.7	59.7	46.7	46.7	27.3	27.3
Actuated g/C Ratio	0.63	0.63	0.49	0.49	0.29	0.29
v/c Ratio	1.06	0.87	0.76	0.51	0.36	1.73
Control Delay	98.3	19.9	13.3	6.4	29.6	358.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.3	19.9	13.3	6.4	29.6	358.7
LOS	F	B	B	A	C	F
Approach Delay	29.2		11.3		308.5	
Approach LOS	C		B		F	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.73

Intersection Signal Delay: 86.2

Intersection LOS: F

Intersection Capacity Utilization 94.1%

ICU Level of Service F

Analysis Period (min) 15

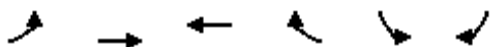
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	230	1700	1170	480	160	890
Future Volume (veh/h)	230	1700	1170	480	160	890
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	261	1932	1330	0	182	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	348	2731	2300		260	
Arrive On Green	0.11	1.00	0.21	0.00	0.15	0.00
Sat Flow, veh/h	1781	3647	3676	1598	1767	1572
Grp Volume(v), veh/h	261	1932	1330	0	182	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1767	1572
Q Serve(g_s), s	4.4	0.0	31.7	0.0	9.3	0.0
Cycle Q Clear(g_c), s	4.4	0.0	31.7	0.0	9.3	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	348	2731	2300		260	
V/C Ratio(X)	0.75	0.71	0.58		0.70	
Avail Cap(c_a), veh/h	367	2731	2300		502	
HCM Platoon Ratio	1.33	1.33	0.33	0.33	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	0.00
Uniform Delay (d), s/veh	16.7	0.0	25.9	0.0	38.5	0.0
Incr Delay (d2), s/veh	7.9	1.6	0.1	0.0	4.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.6	15.1	0.0	4.3	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.6	1.6	26.0	0.0	43.3	0.0
LnGrp LOS	C	A	C		D	
Approach Vol, veh/h		2193	1330	A	182	A
Approach Delay, s/veh		4.3	26.0		43.3	
Approach LOS		A	C		D	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	12.0	65.0		18.0		77.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	8.0	45.0		25.0		58.0
Max Q Clear Time (g_c+I1), s	6.4	33.7		11.3		2.0
Green Ext Time (p_c), s	0.2	5.5		0.8		30.1

Intersection Summary

HCM 6th Ctrl Delay	14.0
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	890	970	0	0	1350	300	300	0	800	0	0	0
Future Volume (vph)	890	970	0	0	1350	300	300	0	800	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1780	3574	0	0	3574	1599	0	1752	1568	0	0	0
Flt Permitted	0.125							0.950				
Satd. Flow (perm)	234	3574	0	0	3574	1599	0	1752	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						326			431			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
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
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	967	1054	0	0	1467	326	326	0	870	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	967	1054	0	0	1467	326	0	326	870	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Free			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	31.0	64.0			33.0	33.0	31.0	31.0				
Total Split (%)	32.6%	67.4%			34.7%	34.7%	32.6%	32.6%				
Maximum Green (s)	26.0	58.0			27.0	27.0	25.0	25.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	63.0	63.0			29.0	29.0		24.0	95.0			
Actuated g/C Ratio	0.66	0.66			0.31	0.31		0.25	1.00			
v/c Ratio	1.50	0.44			1.34	0.46		0.74	0.55			
Control Delay	252.6	2.8			190.9	5.2		42.9	1.4			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	252.6	2.8			190.9	5.2		42.9	1.4			
LOS	F	A			F	A		D	A			
Approach Delay	122.3				157.2				12.7			
Approach LOS	F				F				B			

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 54 (57%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.50

Intersection Signal Delay: 108.6

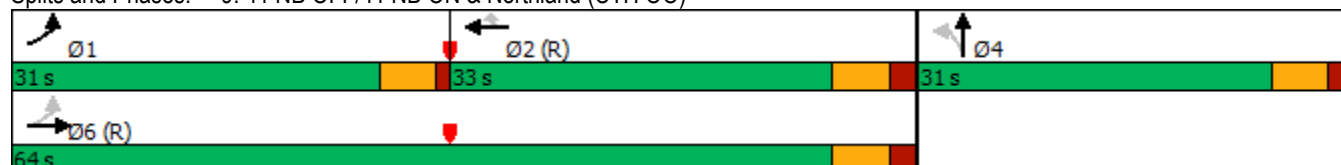
Intersection LOS: F

Intersection Capacity Utilization 113.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	890	970	0	0	1350	300	300	0	800	0	0	0
Future Volume (veh/h)	890	970	0	0	1350	300	300	0	800	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856			
Adj Flow Rate, veh/h	967	1054	0	0	1467	0	326	0	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3			
Cap, veh/h	586	2465	0	0	1296		402	0				
Arrive On Green	0.57	1.00	0.00	0.00	0.12	0.00	0.23	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3676	1598	1767	0	1572			
Grp Volume(v), veh/h	967	1054	0	0	1467	0	326	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1791	1598	1767	0	1572			
Q Serve(g_s), s	27.0	0.0	0.0	0.0	34.4	0.0	16.6	0.0	0.0			
Cycle Q Clear(g_c), s	27.0	0.0	0.0	0.0	34.4	0.0	16.6	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	586	2465	0	0	1296		402	0				
V/C Ratio(X)	1.65	0.43	0.00	0.00	1.13		0.81	0.00				
Avail Cap(c_a), veh/h	586	2465	0	0	1296		502	0				
HCM Platoon Ratio	2.00	2.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.46	0.46	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	14.5	0.0	0.0	0.0	41.8	0.0	34.7	0.0	0.0			
Incr Delay (d2), s/veh	296.0	0.3	0.0	0.0	69.6	0.0	8.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	54.7	0.1	0.0	0.0	28.9	0.0	8.0	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	310.6	0.3	0.0	0.0	111.4	0.0	43.6	0.0	0.0			
LnGrp LOS	F	A	A	A	F		D	A				
Approach Vol, veh/h	2021			1467			A			326		
Approach Delay, s/veh	148.7			111.4			43.6					
Approach LOS	F			F			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	38.4		25.6		69.4						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	26.0	27.0		25.0		58.0						
Max Q Clear Time (g_c+I1), s	29.0	36.4		18.6		2.0						
Green Ext Time (p_c), s	0.0	0.0		1.0		6.4						

Intersection Summary

HCM 6th Ctrl Delay 125.4

HCM 6th LOS F

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

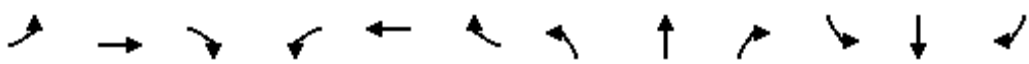
08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frnt						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	510	450	1110	0	0	1140	660
Future Volume (vph)	0	0	0	230	0	510	450	1110	0	0	1140	660
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3467	1881	1599	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.098					
Satd. Flow (perm)	0	0	0	3467	1881	1599	184	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						103						539
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	258	0	573	506	1247	0	0	1281	742
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	258	0	573	506	1247	0	0	1281	742
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				26.0	26.0	26.0	31.0	74.0			43.0	43.0
Total Split (%)				26.0%	26.0%	26.0%	31.0%	74.0%			43.0%	43.0%
Maximum Green (s)				20.0	20.0	20.0	27.0	68.0			37.0	37.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				22.0		22.0	70.0	70.0			39.0	39.0
Actuated g/C Ratio				0.22		0.22	0.70	0.70			0.39	0.39
v/c Ratio				0.34		1.33	0.90	0.50			0.93	0.78
Control Delay				34.4		190.3	29.6	6.1			42.1	13.9
Queue Delay				0.0		0.0	0.0	1.0			0.0	0.0
Total Delay				34.4		190.3	29.6	7.1			42.1	13.9
LOS				C		F	C	A			D	B
Approach Delay					141.9			13.6			31.8	
Approach LOS					F			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 69 (69%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.33

Intersection Signal Delay: 44.7

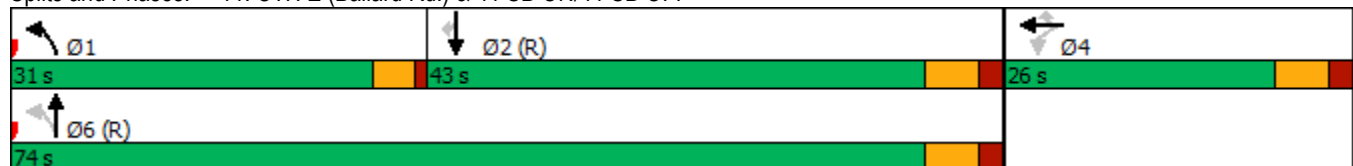
Intersection LOS: D

Intersection Capacity Utilization 85.6%

ICU Level of Service E

Analysis Period (min) 15

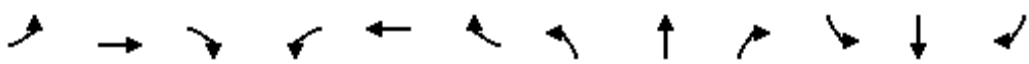
Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	230	0	510	450	1110	0	0	1140	660
Future Volume (veh/h)	0	0	0	230	0	510	450	1110	0	0	1140	660
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				258	0	0	506	1247	0	0	1281	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				766	415		573	2507	0	0	1386	
Arrive On Green				0.22	0.00	0.00	0.18	0.47	0.00	0.00	0.52	0.00
Sat Flow, veh/h				3483	1885	1598	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				258	0	0	506	1247	0	0	1281	0
Grp Sat Flow(s),veh/h/ln				1742	1885	1598	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.2	0.0	0.0	22.4	24.1	0.0	0.0	33.3	0.0
Cycle Q Clear(g_c), s				6.2	0.0	0.0	22.4	24.1	0.0	0.0	33.3	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				766	415		573	2507	0	0	1386	
V/C Ratio(X)				0.34	0.00		0.88	0.50	0.00	0.00	0.92	
Avail Cap(c_a), veh/h				766	415		573	2507	0	0	1386	
HCM Platoon Ratio				1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.31	0.31	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				32.9	0.0	0.0	31.2	14.4	0.0	0.0	22.7	0.0
Incr Delay (d2), s/veh				1.2	0.0	0.0	6.6	0.2	0.0	0.0	11.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.7	0.0	0.0	13.0	10.5	0.0	0.0	14.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				34.0	0.0	0.0	37.7	14.6	0.0	0.0	34.5	0.0
LnGrp LOS				C	A		D	B	A	A	C	
Approach Vol, veh/h					258	A		1753			1281	A
Approach Delay, s/veh					34.0			21.3			34.5	
Approach LOS					C			C			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	43.0		26.0		74.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	27.0	37.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	24.4	35.3		8.2		26.1						
Green Ext Time (p_c), s	0.4	1.3		1.2		4.3						

Intersection Summary

HCM 6th Ctrl Delay	27.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	420	0	150	0	0	0	0	1140	190	580	790	0
Future Volume (vph)	420	0	150	0	0	0	0	1140	190	580	790	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.111		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3574	1599	209	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			238						202			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	447	0	160	0	0	0	0	1213	202	617	840	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	447	0	160	0	0	0	0	1213	202	617	840	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

5:00 pm Baseline

Synchro 10 Report
Page 10

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

Intersection Summary	
Area Type:	Other
Cycle Length: 100	
Actuated Cycle Length: 100	
Offset: 7 (7%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 31.3	Intersection LOS: C
Intersection Capacity Utilization 85.6%	ICU Level of Service E
Analysis Period (min) 15	

The figure shows a Gantt chart with four horizontal bars representing machine schedules. The bars are color-coded: green for primary tasks, yellow for secondary tasks, and red for tertiary tasks. The durations are as follows:

- Machine 1 (top-left): 76 s (green), followed by yellow and red segments.
- Machine 2 (bottom-left): 38 s (green), followed by yellow and red segments.
- Machine 3 (top-right): 24 s (green), followed by yellow and red segments.
- Machine 4 (bottom-right): 38 s (green), followed by yellow and red segments.

Arrows indicate specific events or resources associated with each machine's schedule:

- Machine 1: Downward arrow labeled Ø2 (R).
- Machine 2: Downward arrow labeled Ø5.
- Machine 3: Upward arrow labeled Ø4.
- Machine 4: Upward arrow labeled Ø6 (R).

HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	420	0	150	0	0	0	0	1140	190	580	790	0
Future Volume (veh/h)	420	0	150	0	0	0	0	1140	190	580	790	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	447	0	0				0	1213	0	617	840	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	697	377					0	1218		682	2579	0
Arrive On Green	0.20	0.00	0.00				0.00	0.68	0.00	0.23	0.48	0.00
Sat Flow, veh/h	3483	1885	1598				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	447	0	0				0	1213	0	617	840	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1791	1598	1795	1791	0
Q Serve(g_s), s	11.8	0.0	0.0				0.0	33.6	0.0	29.3	14.4	0.0
Cycle Q Clear(g_c), s	11.8	0.0	0.0				0.0	33.6	0.0	29.3	14.4	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	697	377					0	1218		682	2579	0
V/C Ratio(X)	0.64	0.00					0.00	1.00		0.90	0.33	0.00
Avail Cap(c_a), veh/h	697	377					0	1218		682	2579	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.45	0.45	0.00
Uniform Delay (d), s/veh	36.7	0.0	0.0				0.0	15.9	0.0	31.3	11.0	0.0
Incr Delay (d2), s/veh	4.5	0.0	0.0				0.0	24.9	0.0	9.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	0.0	0.0				0.0	10.0	0.0	16.2	6.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.2	0.0	0.0				0.0	40.8	0.0	40.6	11.1	0.0
LnGrp LOS	D	A					A	D		D	B	A
Approach Vol, veh/h	447			A			1213			A		
Approach Delay, s/veh	41.2						40.8			23.6		
Approach LOS	D						D			C		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	76.0			24.0			38.0			38.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	70.0			18.0			34.0			32.0		
Max Q Clear Time (g_c+I1), s	16.4			13.8			31.3			35.6		
Green Ext Time (p_c), s	2.5			1.1			0.6			0.0		
Intersection Summary												
HCM 6th Ctrl Delay			32.8									
HCM 6th LOS			C									
Notes												

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (vph)	0	0	0	350	0	120	340	550	0	0	310	200
Future Volume (vph)	0	0	0	350	0	120	340	550	0	0	310	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3574	1599
Flt Permitted					0.950		0.494					
Satd. Flow (perm)	0	0	0	0	1787	1599	929	3574	0	0	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						104						238
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	417	0	143	405	655	0	0	369	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	417	143	405	655	0	0	369	238
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

5:00 pm Baseline

Synchro 10 Report
Page 3

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					24.7	24.7	38.9	38.9			22.6	22.6
Actuated g/C Ratio					0.34	0.34	0.54	0.54			0.32	0.32
v/c Ratio					0.68	0.23	0.62	0.34			0.33	0.36
Control Delay					27.0	7.5	18.9	9.9			20.5	4.9
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					27.0	7.5	18.9	9.9			20.5	4.9
LOS					C	A	B	A			C	A
Approach Delay					22.0			13.3			14.4	
Approach LOS					C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 71.6

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 15.8

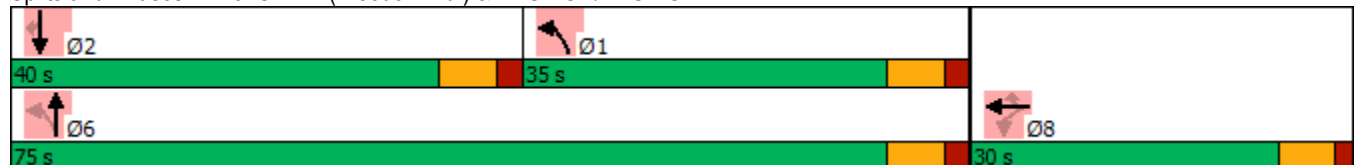
Intersection LOS: B

Intersection Capacity Utilization 64.9%

ICU Level of Service C

Analysis Period (min) 15

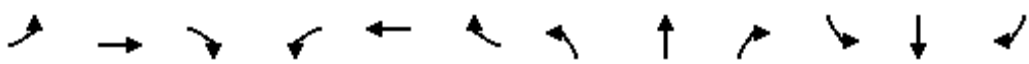
Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↖	↗	↖	↗			↗	↖
Traffic Volume (veh/h)	0	0	0	350	0	120	340	550	0	0	310	200
Future Volume (veh/h)	0	0	0	350	0	120	340	550	0	0	310	200
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1885	1885
Adj Flow Rate, veh/h				417	0	0	405	655	0	0	369	0
Peak Hour Factor				0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %				1	1	1	1	1	0	0	1	1
Cap, veh/h				529	0		621	2078	0	0	1263	
Arrive On Green				0.29	0.00	0.00	0.16	0.58	0.00	0.00	0.35	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3676	1598
Grp Volume(v), veh/h				417	0	0	405	655	0	0	369	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1791	1598
Q Serve(g_s), s				13.6	0.0	0.0	0.6	6.0	0.0	0.0	4.7	0.0
Cycle Q Clear(g_c), s				13.6	0.0	0.0	0.6	6.0	0.0	0.0	4.7	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				529	0		621	2078	0	0	1263	
V/C Ratio(X)				0.79	0.00		0.65	0.32	0.00	0.00	0.29	
Avail Cap(c_a), veh/h				732	0		1198	3987	0	0	2022	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				20.7	0.0	0.0	18.8	6.9	0.0	0.0	14.9	0.0
Incr Delay (d2), s/veh				4.0	0.0	0.0	1.7	0.1	0.0	0.0	0.2	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				5.8	0.0	0.0	5.1	1.8	0.0	0.0	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				24.6	0.0	0.0	20.5	7.0	0.0	0.0	15.1	0.0
LnGrp LOS				C	A		C	A	A	A	B	
Approach Vol, veh/h					417	A		1060			369	A
Approach Delay, s/veh					24.6			12.1			15.1	
Approach LOS					C			B			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		22.8				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.6	6.7				8.0		15.6				
Green Ext Time (p_c), s	2.8	2.6				3.4		1.2				

Intersection Summary

HCM 6th Ctrl Delay	15.5
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	430	0	360	0	0	0	0	460	140	90	570	0
Future Volume (vph)	430	0	360	0	0	0	0	460	140	90	570	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1752	1568	0	0	0	0	3438	1538	1752	3505	0
Flt Permitted		0.950								0.408		
Satd. Flow (perm)	0	1752	1568	0	0	0	0	3438	1538	753	3505	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			348						121			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	5%	5%	5%	3%	3%	3%
Adj. Flow (vph)	462	0	387	0	0	0	0	495	151	97	613	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	462	387	0	0	0	0	495	151	97	613	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

5:00 pm Baseline

Synchro 10 Report
Page 6

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

Intersection Summary

Cycle Length: 105

Natural Cycle: 60

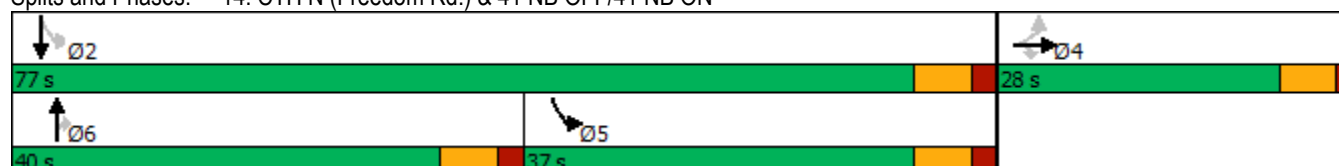
Maximum v/c Ratio: 0.72

Intersection LOS: B

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	430	0	360	0	0	0	0	460	140	90	570	0
Future Volume (veh/h)	430	0	360	0	0	0	0	460	140	90	570	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1826	1826	1856	1856	0
Adj Flow Rate, veh/h	462	0	0				0	495	0	97	613	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3				0	5	5	3	3	0
Cap, veh/h	563	0					0	1182		536	1975	0
Arrive On Green	0.32	0.00	0.00				0.00	0.34	0.00	0.16	0.56	0.00
Sat Flow, veh/h	1767	0	1572				0	3561	1547	1767	3618	0
Grp Volume(v), veh/h	462	0	0				0	495	0	97	613	0
Grp Sat Flow(s),veh/h/ln	1767	0	1572				0	1735	1547	1767	1763	0
Q Serve(g_s), s	15.9	0.0	0.0				0.0	7.2	0.0	0.0	6.1	0.0
Cycle Q Clear(g_c), s	15.9	0.0	0.0				0.0	7.2	0.0	0.0	6.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	563	0					0	1182		536	1975	0
V/C Ratio(X)	0.82	0.00					0.00	0.42		0.18	0.31	0.00
Avail Cap(c_a), veh/h	642	0					0	1891		1138	3897	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.8	0.0	0.0				0.0	16.7	0.0	17.0	7.7	0.0
Incr Delay (d2), s/veh	8.1	0.0	0.0				0.0	0.2	0.0	0.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.3	0.0	0.0				0.0	2.7	0.0	1.1	1.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.9	0.0	0.0				0.0	17.0	0.0	17.3	7.8	0.0
LnGrp LOS	C	A					A	B		B	A	A
Approach Vol, veh/h		462	A					495	A		710	
Approach Delay, s/veh		28.9						17.0			9.1	
Approach LOS		C						B			A	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		41.0		25.0	14.5	26.5						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		70.5		22.0	30.5	33.5						
Max Q Clear Time (g_c+I1), s		8.1		17.9	2.0	9.2						
Green Ext Time (p_c), s		3.2		1.1	0.5	2.3						
Intersection Summary												
HCM 6th Ctrl Delay			16.9									
HCM 6th LOS			B									
Notes												

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	220	0	140	80	220	0	0	130	50
Future Volume (vph)	0	0	0	220	0	140	80	220	0	0	130	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.948							0.850
Flt Protected					0.970		0.950					
Satd. Flow (prot)	0	0	0	0	1680	0	1787	1881	0	0	1845	1568
Flt Permitted					0.970		0.950					
Satd. Flow (perm)	0	0	0	0	1680	0	1787	1881	0	0	1845	1568
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	1%	1%	1%	3%	3%	3%
Parking (#/hr)			0									
Adj. Flow (vph)	0	0	0	250	0	159	91	250	0	0	148	57
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	409	0	91	250	0	0	148	57
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	15.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕		↕	↑			↑	↗
Traffic Vol, veh/h	0	0	0	220	0	140	80	220	0	0	130	50
Future Vol, veh/h	0	0	0	220	0	140	80	220	0	0	130	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	4	4	4	1	1	1	3	3	3
Mvmt Flow	0	0	0	250	0	159	91	250	0	0	148	57
Major/Minor												
Minor1				Major1				Major2				
Conflicting Flow All	609	637	250	205	0	-	-	-	-	-	0	-
Stage 1	432	432	-	-	-	-	-	-	-	-	-	-
Stage 2	177	205	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	6.44	6.54	6.24	4.11	-	-	-	-	-	-	-	-
Critical Hdwy Stg 1	5.44	5.54	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.44	5.54	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	2.209	-	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	455	392	784	1372	-	0	0	-	-	-	-	-
Stage 1	650	579	-	-	-	0	0	-	-	-	-	-
Stage 2	849	728	-	-	-	0	0	-	-	-	-	-
Platoon blocked, %					-			-		-		-
Mov Cap-1 Maneuver	425	0	784	1372	-	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	425	0	-	-	-	-	-	-	-	-	-	-
Stage 1	607	0	-	-	-	-	-	-	-	-	-	-
Stage 2	849	0	-	-	-	-	-	-	-	-	-	-
Approach												
WB				NB				SB				
HCM Control Delay, s	33.4			2.1				0				
HCM LOS	D											
Minor Lane/Major Mvmt												
NBL				NBTWBLn1				SBT SBR				
Capacity (veh/h)	1372	-	517	-	-	-	-	-	-	-	-	-
HCM Lane V/C Ratio	0.066	-	0.791	-	-	-	-	-	-	-	-	-
HCM Control Delay (s)	7.8	-	33.4	-	-	-	-	-	-	-	-	-
HCM Lane LOS	A	-	D	-	-	-	-	-	-	-	-	-
HCM 95th %tile Q(veh)	0.2	-	7.4	-	-	-	-	-	-	-	-	-

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	0	70	0	0	0	0	220	130	70	280	0
Future Volume (vph)	80	0	70	0	0	0	0	220	130	70	280	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.937							0.850			
Flt Protected		0.974								0.950		
Satd. Flow (prot)	0	1717	0	0	0	0	0	1845	1568	1787	1881	0
Flt Permitted		0.974								0.950		
Satd. Flow (perm)	0	1717	0	0	0	0	0	1845	1568	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	3%	3%	3%	1%	1%	1%
Adj. Flow (vph)	93	0	81	0	0	0	0	256	151	81	326	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	174	0	0	0	0	0	256	151	81	326	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection													
Int Delay, s/veh	4												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕						↑	↗	↘	↑		
Traffic Vol, veh/h	80	0	70	0	0	0	0	220	130	70	280	0	
Future Vol, veh/h	80	0	70	0	0	0	0	220	130	70	280	0	
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None	
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-	
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-	
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-	
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86	
Heavy Vehicles, %	1	1	1	4	4	4	3	3	3	1	1	1	
Mvmt Flow	93	0	81	0	0	0	0	256	151	81	326	0	
Major/Minor	Minor2			Major1				Major2					
Conflicting Flow All	820	895	326					-	0	0	407	0	0
Stage 1	488	488	-					-	-	-	-	-	-
Stage 2	332	407	-					-	-	-	-	-	-
Critical Hdwy	6.41	6.51	6.21					-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.41	5.51	-					-	-	-	-	-	-
Critical Hdwy Stg 2	5.41	5.51	-					-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309					-	-	-	2.209	-	-
Pot Cap-1 Maneuver	346	281	718					0	-	-	1157	-	0
Stage 1	619	552	-					0	-	-	-	-	0
Stage 2	729	599	-					0	-	-	-	-	0
Platoon blocked, %									-	-	-		
Mov Cap-1 Maneuver	322	0	718					-	-	-	1157	-	-
Mov Cap-2 Maneuver	322	0	-					-	-	-	-	-	-
Stage 1	576	0	-					-	-	-	-	-	-
Stage 2	729	0	-					-	-	-	-	-	-
Approach	EB			NB				SB					
HCM Control Delay, s	18.8			0				1.7					
HCM LOS	C												
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	SBL	SBT							
Capacity (veh/h)		-	-	434	1157	-							
HCM Lane V/C Ratio		-	-	0.402	0.07	-							
HCM Control Delay (s)		-	-	18.8	8.3	-							
HCM Lane LOS		-	-	C	A	-							
HCM 95th %tile Q(veh)		-	-	1.9	0.2	-							

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	210	80	120	130	0	0	0	0	100	0	290
Future Volume (vph)	0	210	80	120	130	0	0	0	0	100	0	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850										0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	247	94	141	153	0	0	0	0	118	0	341
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	247	94	141	153	0	0	0	0	0	118	341
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	33.2%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	6.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↘	↑						↑	↗
Traffic Vol, veh/h	0	210	80	120	130	0	0	0	0	100	0	290
Future Vol, veh/h	0	210	80	120	130	0	0	0	0	100	0	290
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	247	94	141	153	0	0	0	0	118	0	341
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	341	0	0				729	776	153
Stage 1	-	-	-	-	-	-				435	435	-
Stage 2	-	-	-	-	-	-				294	341	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1224	-	0				390	328	893
Stage 1	0	-	-	-	-	0				653	580	-
Stage 2	0	-	-	-	-	0				756	639	-
Platoon blocked, %	-	-	-	-	-	-				-	-	-
Mov Cap-1 Maneuver	-	-	-	1224	-	-				345	0	893
Mov Cap-2 Maneuver	-	-	-	-	-	-				345	0	-
Stage 1	-	-	-	-	-	-				578	0	-
Stage 2	-	-	-	-	-	-				756	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			4			13.9					
HCM LOS							B					
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1224	-	345	893						
HCM Lane V/C Ratio	-	-	0.115	-	0.341	0.382						
HCM Control Delay (s)	-	-	8.3	-	20.7	11.5						
HCM Lane LOS	-	-	A	-	C	B						
HCM 95th %tile Q(veh)	-	-	0.4	-	1.5	1.8						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	160	0	0	190	170	60	0	130	0	0	0
Future Volume (vph)	150	160	0	0	190	170	60	0	130	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	170	182	0	0	216	193	68	0	148	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	182	0	0	216	193	0	68	148	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	33.2%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	160	0	0	190	170	60	0	130	0	0	0
Future Vol, veh/h	150	160	0	0	190	170	60	0	130	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	170	182	0	0	216	193	68	0	148	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	409	0	-	-	-	0	835	931	182
Stage 1	-	-	-	-	-	-	522	522	-
Stage 2	-	-	-	-	-	-	313	409	-
Critical Hdwy	4.11	-	-	-	-	-	6.45	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45	5.55	-
Follow-up Hdwy	2.209	-	-	-	-	-	3.545	4.045	3.345
Pot Cap-1 Maneuver	1155	-	0	0	-	-	334	264	853
Stage 1	-	-	0	0	-	-	589	526	-
Stage 2	-	-	0	0	-	-	735	591	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1155	-	-	-	-	-	285	0	853
Mov Cap-2 Maneuver	-	-	-	-	-	-	285	0	-
Stage 1	-	-	-	-	-	-	502	0	-
Stage 2	-	-	-	-	-	-	735	0	-

Approach	EB			WB			NB		
HCM Control Delay, s	4.2			0			13.7		
HCM LOS							B		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR
Capacity (veh/h)	285	853	1155	-	-	-
HCM Lane V/C Ratio	0.239	0.173	0.148	-	-	-
HCM Control Delay (s)	21.6	10.1	8.7	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	0.9	0.6	0.5	-	-	-

APPENDIX O6

Year 2048 No Build Synchro AM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	670	230	160	540	0	0	0	0	140	0	550
Future Volume (vph)	0	670	230	160	540	0	0	0	0	140	0	550
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1792	1524	1719	1810	0	0	0	0	0	1656	1482
Flt Permitted				0.105							0.950	
Satd. Flow (perm)	0	1792	1524	190	1810	0	0	0	0	0	1656	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			206									178
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	1%	1%	1%	9%	9%	9%
Adj. Flow (vph)	0	859	295	205	692	0	0	0	0	179	0	705
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	859	295	205	692	0	0	0	0	0	179	705
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		38.0	38.0	16.0	54.0					46.0	46.0	46.0
Total Split (%)		38.0%	38.0%	16.0%	54.0%					46.0%	46.0%	46.0%
Maximum Green (s)		31.5	31.5	9.5	47.5					40.0	40.0	40.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		34.0	34.0	49.7	49.7						41.5	41.5
Actuated g/C Ratio		0.34	0.34	0.50	0.50						0.42	0.42
v/c Ratio		1.40	0.45	0.75	0.76						0.26	0.98
Control Delay		218.4	10.4	51.8	27.0						20.1	50.4
Queue Delay		0.0	0.0	0.0	22.1						0.0	0.0
Total Delay		218.4	10.4	51.8	49.1						20.1	50.4
LOS		F	B	D	D						C	D
Approach Delay		165.2			49.7						44.3	
Approach LOS		F			D						D	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 99.2

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.40

Intersection Signal Delay: 93.5

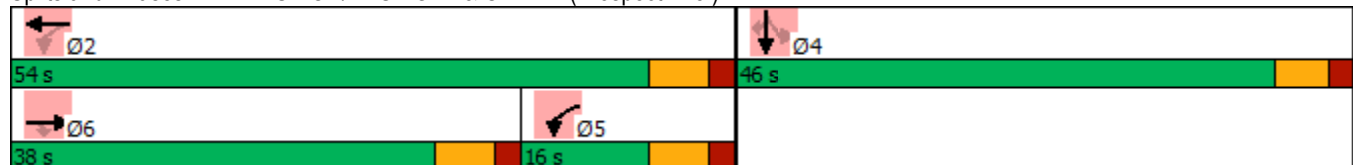
Intersection LOS: F

Intersection Capacity Utilization 72.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

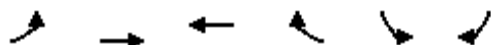
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	670	230	160	540	0	0	0	0	140	0	550
Future Volume (veh/h)	0	670	230	160	540	0	0	0	0	140	0	550
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1811	1811	1826	1826	0				1767	1767	1767
Adj Flow Rate, veh/h	0	859	295	205	692	0				179	0	705
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	6	6	5	5	0				9	9	9
Cap, veh/h	0	618	524	274	909	0				710	0	632
Arrive On Green	0.00	0.34	0.34	0.12	0.50	0.00				0.42	0.00	0.42
Sat Flow, veh/h	0	1811	1535	1739	1826	0				1682	0	1497
Grp Volume(v), veh/h	0	859	295	205	692	0				179	0	705
Grp Sat Flow(s),veh/h/ln	0	1811	1535	1739	1826	0				1682	0	1497
Q Serve(g_s), s	0.0	34.0	15.6	7.1	30.5	0.0				6.9	0.0	42.0
Cycle Q Clear(g_c), s	0.0	34.0	15.6	7.1	30.5	0.0				6.9	0.0	42.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	618	524	274	909	0				710	0	632
V/C Ratio(X)	0.00	1.39	0.56	0.75	0.76	0.00				0.25	0.00	1.12
Avail Cap(c_a), veh/h	0	618	524	282	917	0				710	0	632
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	32.8	26.7	40.8	20.2	0.0				18.6	0.0	28.8
Incr Delay (d2), s/veh	0.0	184.9	1.7	10.2	4.0	0.0				0.2	0.0	72.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	46.2	5.8	5.2	13.3	0.0				2.7	0.0	40.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	217.7	28.5	50.9	24.2	0.0				18.8	0.0	101.0
LnGrp LOS	A	F	C	D	C	A				B	A	F
Approach Vol, veh/h	1154		897				884					
Approach Delay, s/veh	169.3		30.3				84.3					
Approach LOS	F		C				F					
Timer - Assigned Phs	2		4		5	6						
Phs Duration (G+Y+Rc), s	53.6		46.0		15.6	38.0						
Change Period (Y+Rc), s	6.5		6.0		6.5	6.5						
Max Green Setting (Gmax), s	47.5		40.0		9.5	31.5						
Max Q Clear Time (g_c+I1), s	32.5		44.0		9.1	36.0						
Green Ext Time (p_c), s	4.4		0.0		0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay	101.2											
HCM 6th LOS	F											

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	520	290	700	90	0	0
Future Volume (vph)	520	290	700	90	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1736	1827	1863	1583	0	0
Flt Permitted	0.132					
Satd. Flow (perm)	241	1827	1863	1583	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				110		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Adj. Flow (vph)	634	354	854	110	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	634	354	854	110	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0	20.0		
Minimum Split (s)	20.5	26.5	26.5	26.5		

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	53.1	57.2	26.4	26.4		
Actuated g/C Ratio	0.93	1.00	0.46	0.46		
v/c Ratio	0.78	0.19	0.99	0.14		
Control Delay	17.0	0.2	50.4	3.7		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	17.2	0.2	50.4	3.7		
LOS	B	A	D	A		
Approach Delay		11.1	45.1			
Approach LOS		B	D			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 57.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 27.9

Intersection LOS: C

Intersection Capacity Utilization 72.3%

ICU Level of Service C

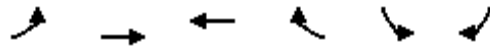
Analysis Period (min) 15

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary 2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	520	290	700	90	0	0
Future Volume (veh/h)	520	290	700	90	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1841	1841	1870	1870		
Adj Flow Rate, veh/h	634	354	854	110		
Peak Hour Factor	0.82	0.82	0.82	0.82		
Percent Heavy Veh, %	4	4	2	2		
Cap, veh/h	785	1705	898	761		
Arrive On Green	0.37	0.93	0.48	0.48		
Sat Flow, veh/h	1753	1841	1870	1585		
Grp Volume(v), veh/h	634	354	854	110		
Grp Sat Flow(s),veh/h/ln	1753	1841	1870	1585		
Q Serve(g_s), s	12.8	1.0	23.7	2.1		
Cycle Q Clear(g_c), s	12.8	1.0	23.7	2.1		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	785	1705	898	761		
V/C Ratio(X)	0.81	0.21	0.95	0.14		
Avail Cap(c_a), veh/h	1234	3263	898	761		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	13.4	0.2	13.5	7.9		
Incr Delay (d2), s/veh	2.2	0.1	19.3	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	4.7	0.0	12.6	0.6		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	15.6	0.3	32.8	8.0		
LnGrp LOS	B	A	C	A		
Approach Vol, veh/h		988	964			
Approach Delay, s/veh		10.1	30.0			
Approach LOS		B	C			
Timer - Assigned Phs	1	2		6		
Phs Duration (G+Y+Rc), s	24.2	30.0		54.2		
Change Period (Y+Rc), s	6.5	6.5		6.5		
Max Green Setting (Gmax), s	31.5	23.5		93.5		
Max Q Clear Time (g_c+I1), s	14.8	25.7		3.0		
Green Ext Time (p_c), s	2.8	0.0		2.5		
Intersection Summary						
HCM 6th Ctrl Delay			19.9			
HCM 6th LOS			B			

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	290	0	0	570	220	460
Future Volume (vph)	290	0	0	570	220	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1845	0	0	1881	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1845	0	0	1881	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						487
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	1%	1%	2%	2%
Adj. Flow (vph)	345	0	0	679	262	548
Shared Lane Traffic (%)						
Lane Group Flow (vph)	345	0	0	679	262	548
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Walk Time (s)	5.0			5.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		
Act Effect Green (s)	31.3			31.3	18.7	18.7
Actuated g/C Ratio	0.54			0.54	0.32	0.32
v/c Ratio	0.35			0.67	0.46	0.66
Control Delay	9.5			14.5	20.5	7.6
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.5			14.5	20.5	7.6
LOS	A			B	C	A
Approach Delay	9.5			14.5	11.8	
Approach LOS	A			B	B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 58.5

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 12.4

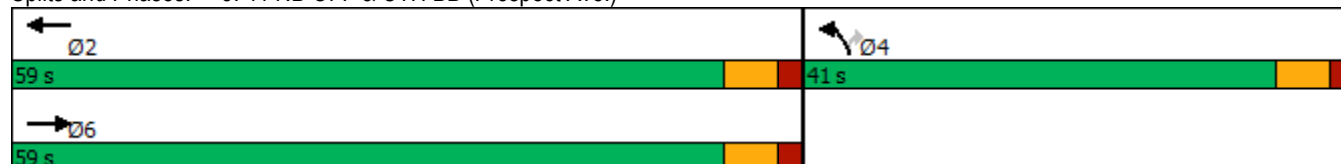
Intersection LOS: B

Intersection Capacity Utilization 51.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↖	↗
Traffic Volume (veh/h)	290	0	0	570	220	460
Future Volume (veh/h)	290	0	0	570	220	460
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1885	1870	1870
Adj Flow Rate, veh/h	345	0	0	679	262	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	0	0	1	2	2
Cap, veh/h	983	0	0	999	494	
Arrive On Green	0.53	0.00	0.00	0.53	0.28	0.00
Sat Flow, veh/h	1856	0	0	1885	1781	1585
Grp Volume(v), veh/h	345	0	0	679	262	0
Grp Sat Flow(s),veh/h/ln	1856	0	0	1885	1781	1585
Q Serve(g_s), s	4.5	0.0	0.0	11.0	5.2	0.0
Cycle Q Clear(g_c), s	4.5	0.0	0.0	11.0	5.2	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	983	0	0	999	494	
V/C Ratio(X)	0.35	0.00	0.00	0.68	0.53	
Avail Cap(c_a), veh/h	2458	0	0	2498	1588	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.6	0.0	0.0	7.2	12.7	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	1.2	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	3.0	1.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.9	0.0	0.0	8.3	13.6	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	345			679	262	A
Approach Delay, s/veh	5.9			8.3	13.6	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	26.0		15.5		26.0	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	13.0		7.2		6.5	
Green Ext Time (p_c), s	5.7		1.1		2.4	
Intersection Summary						
HCM 6th Ctrl Delay			8.8			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	620	170	300	710	0	0	0	0	240	0	440
Future Volume (vph)	0	620	170	300	710	0	0	0	0	240	0	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0			450		450
Storage Lanes	0		1	1		0	0			1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			198									439
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	721	198	349	826	0	0	0	0	279	0	512
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	721	198	349	826	0	0	0	0	0	279	512
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	5.0	5.0					7.0	7.0	7.0
Minimum Split (s)		9.0	9.0	10.0	11.0					13.0	13.0	13.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.44	0.31	0.53	0.32					0.87	0.58	0.58
Control Delay		28.0	5.0	42.1	4.3					67.5	9.2	9.2
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		28.0	5.0	42.1	4.3					67.5	9.2	9.2
LOS		C	A	D	A					E	A	A
Approach Delay		23.1			15.5					29.8		
Approach LOS		C			B					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 21.8

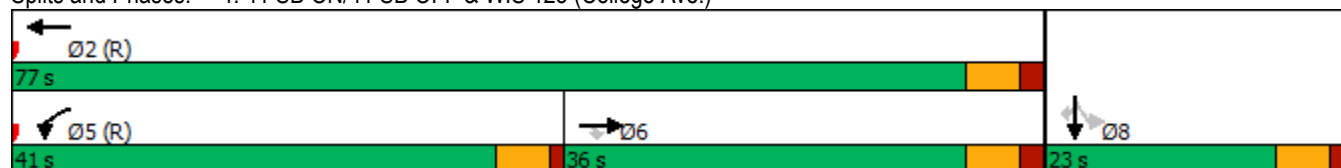
Intersection LOS: C

Intersection Capacity Utilization 45.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	620	170	300	710	0	0	0	0	240	0	440
Future Volume (veh/h)	0	620	170	300	710	0	0	0	0	240	0	440
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	721	0	349	826	0				279	0	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86				0.86	0.86	0.86
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	2347		410	2594	0				677	0	
Arrive On Green	0.00	0.15	0.00	0.23	0.73	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1781	3647	0				3563	0	3170
Grp Volume(v), veh/h	0	721	0	349	826	0				279	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	12.6	0.0	18.8	8.2	0.0				6.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	12.6	0.0	18.8	8.2	0.0				6.9	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2347		410	2594	0				677	0	
V/C Ratio(X)	0.00	0.31		0.85	0.32	0.00				0.41	0.00	
Avail Cap(c_a), veh/h	0	2347		659	2594	0				677	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.77	0.77	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	28.2	0.0	36.8	4.7	0.0				35.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	4.7	0.2	0.0				1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.8	0.0	8.6	2.6	0.0				3.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	28.6	0.0	41.6	5.0	0.0				37.4	0.0	0.0
LnGrp LOS	A	C		D	A	A				D	A	
Approach Vol, veh/h		721	A		1175						279	A
Approach Delay, s/veh		28.6			15.9						37.4	
Approach LOS		C			B						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		77.0			27.0	50.0		23.0				
Change Period (Y+Rc), s		6.0			5.0	6.0		6.0				
Max Green Setting (Gmax), s		71.0			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		10.2			20.8	14.6		8.9				
Green Ext Time (p_c), s		4.6			1.3	3.2		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			22.8									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	630	0	0	710	130	300	0	440	0	0	0
Future Volume (vph)	230	630	0	0	710	130	300	0	440	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.208						0.950					
Satd. Flow (perm)	391	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						151			472			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	267	733	0	0	826	151	349	0	512	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	267	733	0	0	826	151	349	0	512	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	72.0			37.0	37.0	28.0	28.0	28.0			
Total Split (%)	35.0%	72.0%			37.0%	37.0%	28.0%	28.0%	28.0%			
Maximum Green (s)	29.0	66.0			31.0	31.0	23.0	23.0	23.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	68.0	68.0			33.0	33.0	24.0		24.0			
Actuated g/C Ratio	0.68	0.68			0.33	0.33	0.24		0.24			
v/c Ratio	0.38	0.30			0.49	0.24	0.87		0.50			
Control Delay	25.5	7.2			28.0	5.1	59.1		6.2			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	25.5	7.2			28.0	5.1	59.1		6.2			
LOS	C	A			C	A	E		A			
Approach Delay		12.1			24.5			27.6				
Approach LOS		B			C			C				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 21.1

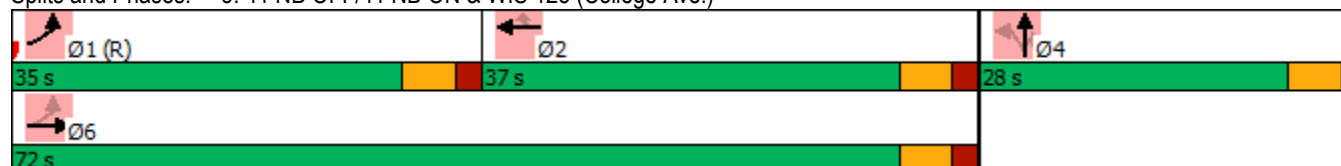
Intersection LOS: C

Intersection Capacity Utilization 45.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (veh/h)	230	630	0	0	710	130	300	0	440	0	0	0
Future Volume (veh/h)	230	630	0	0	710	130	300	0	440	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	267	733	0	0	826	0	349	0	0			
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	529	2436	0	0	2708		855	0				
Arrive On Green	0.11	0.68	0.00	0.00	0.18	0.00	0.24	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	267	733	0	0	826	0	349	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	5.9	8.2	0.0	0.0	14.1	0.0	8.3	0.0	0.0			
Cycle Q Clear(g_c), s	5.9	8.2	0.0	0.0	14.1	0.0	8.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	529	2436	0	0	2708		855	0				
V/C Ratio(X)	0.50	0.30	0.00	0.00	0.30		0.41	0.00				
Avail Cap(c_a), veh/h	889	2436	0	0	2708		855	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.90	0.90	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	8.9	6.4	0.0	0.0	25.2	0.0	32.0	0.0	0.0			
Incr Delay (d2), s/veh	0.7	0.3	0.0	0.0	0.3	0.0	1.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.1	2.9	0.0	0.0	6.5	0.0	3.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.6	6.7	0.0	0.0	25.5	0.0	33.5	0.0	0.0			
LnGrp LOS	A	A	A	A	C		C	A				
Approach Vol, veh/h	1000			826			A	349			A	
Approach Delay, s/veh	7.5			25.5				33.5				
Approach LOS	A			C				C				
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	15.0	57.0		28.0		72.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	31.0		23.0		66.0						
Max Q Clear Time (g_c+I1), s	7.9	16.1		10.3		10.2						
Green Ext Time (p_c), s	1.0	3.7		1.3		3.9						

Intersection Summary

HCM 6th Ctrl Delay 18.5

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	720	280	410	720	0	0	0	0	160	0	360
Future Volume (vph)	0	720	280	410	720	0	0	0	0	160	0	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1770	1583
Flt Permitted				0.147							0.950	
Satd. Flow (perm)	0	5085	1583	274	3539	0	0	0	0	0	1770	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			359									194
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	923	359	526	923	0	0	0	0	205	0	462
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	923	359	526	923	0	0	0	0	0	205	462
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	70.6	70.6						21.4	21.4
Actuated g/C Ratio		0.30	0.30	0.71	0.71						0.21	0.21
v/c Ratio		0.61	0.49	0.71	0.37						0.54	0.94
Control Delay		32.0	5.5	13.5	0.8						40.8	51.7
Queue Delay		0.1	0.0	4.2	1.0						0.0	0.0
Total Delay		32.0	5.5	17.7	1.8						40.8	51.7
LOS		C	A	B	A						D	D
Approach Delay		24.6			7.6						48.4	
Approach LOS		C			A						D	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 22.0

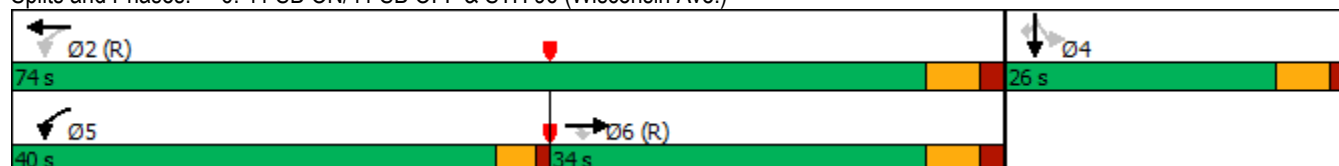
Intersection LOS: C

Intersection Capacity Utilization 58.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (veh/h)	0	720	280	410	720	0	0	0	0	160	0	360
Future Volume (veh/h)	0	720	280	410	720	0	0	0	0	160	0	360
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	923	0	526	923	0				205	0	462
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1532		789	2488	0				392	0	349
Arrive On Green	0.00	0.30	0.00	0.72	1.00	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1781	0	1585
Grp Volume(v), veh/h	0	923	0	526	923	0				205	0	462
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	15.4	0.0	10.7	0.0	0.0				10.1	0.0	22.0
Cycle Q Clear(g_c), s	0.0	15.4	0.0	10.7	0.0	0.0				10.1	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		789	2488	0				392	0	349
V/C Ratio(X)	0.00	0.60		0.67	0.37	0.00				0.52	0.00	1.32
Avail Cap(c_a), veh/h	0	1532		789	2488	0				392	0	349
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.50	0.50	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	29.9	0.0	4.4	0.0	0.0				34.4	0.0	39.0
Incr Delay (d2), s/veh	0.0	1.8	0.0	2.2	0.2	0.0				1.3	0.0	164.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.5	0.0	2.2	0.1	0.0				4.5	0.0	33.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	31.7	0.0	6.6	0.2	0.0				35.6	0.0	203.9
LnGrp LOS	A	C		A	A	A				D	A	F
Approach Vol, veh/h		923	A		1449						667	
Approach Delay, s/veh		31.7			2.5						152.2	
Approach LOS		C			A						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		2.0		24.0	12.7	17.4						
Green Ext Time (p_c), s		8.7		0.0	1.3	4.7						
Intersection Summary												
HCM 6th Ctrl Delay			44.2									
HCM 6th LOS			D									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	690	0	0	780	80	350	0	390	0	0	0
Future Volume (vph)	190	690	0	0	780	80	350	0	390	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.133						0.950					
Satd. Flow (perm)	248	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						99			223			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	235	852	0	0	963	99	432	0	481	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	235	852	0	0	963	99	432	0	481	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	0.33	0.34			0.63	0.18	1.17		0.92			
Control Delay	1.7	3.0			32.5	6.3	138.4		45.6			
Queue Delay	0.6	0.9			0.2	0.0	0.0		0.0			
Total Delay	2.3	3.9			32.6	6.3	138.4		45.6			
LOS	A	A			C	A	F		D			
Approach Delay		3.6			30.2			89.6				
Approach LOS		A			C			F				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 38.4

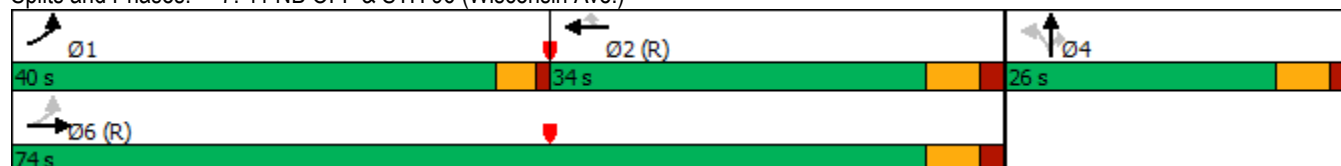
Intersection LOS: D

Intersection Capacity Utilization 58.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	190	690	0	0	780	80	350	0	390	0	0	0
Future Volume (veh/h)	190	690	0	0	780	80	350	0	390	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	235	852	0	0	963	99	432	0	0			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	811	2678	0	0	1806	561	593	0				
Arrive On Green	0.24	0.50	0.00	0.00	0.35	0.35	0.17	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	235	852	0	0	963	99	432	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	4.9	14.1	0.0	0.0	15.0	4.3	11.5	0.0	0.0			
Cycle Q Clear(g_c), s	4.9	14.1	0.0	0.0	15.0	4.3	11.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	811	2678	0	0	1806	561	593	0				
V/C Ratio(X)	0.29	0.32	0.00	0.00	0.53	0.18	0.73	0.00				
Avail Cap(c_a), veh/h	811	2678	0	0	1806	561	784	0				
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.76	0.76	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	9.3	9.6	0.0	0.0	25.7	22.3	39.5	0.0	0.0			
Incr Delay (d2), s/veh	0.7	0.2	0.0	0.0	1.1	0.7	2.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.8	6.1	0.0	0.0	6.2	1.7	5.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.0	9.8	0.0	0.0	26.9	23.0	41.9	0.0	0.0			
LnGrp LOS	A	A	A	A	C	C	D	A				
Approach Vol, veh/h	1087			1062			432			A		
Approach Delay, s/veh	9.9			26.5			41.9					
Approach LOS	A			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	39.4		20.6		79.4						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	6.9	17.0		13.5		16.1						
Green Ext Time (p_c), s	0.5	5.4		1.1		7.6						

Intersection Summary

HCM 6th Ctrl Delay	22.1
HCM 6th LOS	C

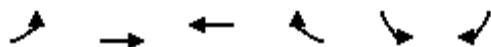
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019

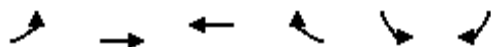


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	280	1560	810	460	230	1090
Future Volume (vph)	280	1560	810	460	230	1090
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1763	3539	3505	1568	1770	1583
Flt Permitted	0.097				0.950	
Satd. Flow (perm)	180	3539	3505	1568	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				605		249
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	368	2053	1066	605	303	1434
Shared Lane Traffic (%)						
Lane Group Flow (vph)	368	2053	1066	605	303	1434
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	16.0
Total Split (s)	15.0	45.0	45.0	45.0	40.0	40.0
Total Split (%)	15.0%	45.0%	45.0%	45.0%	40.0%	40.0%
Maximum Green (s)	10.0	39.0	39.0	39.0	34.0	34.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	Min	Min	Min	None	None
Act Effct Green (s)	53.1	53.1	38.1	38.1	36.0	36.0
Actuated g/C Ratio	0.55	0.55	0.39	0.39	0.37	0.37
v/c Ratio	1.33	1.06	0.78	0.62	0.46	1.93
Control Delay	195.3	62.0	30.3	4.7	26.8	443.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	195.3	62.0	30.3	4.7	26.8	443.4
LOS	F	E	C	A	C	F
Approach Delay		82.2	21.0		370.7	
Approach LOS		F	C		F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 97.2

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.93

Intersection Signal Delay: 150.7

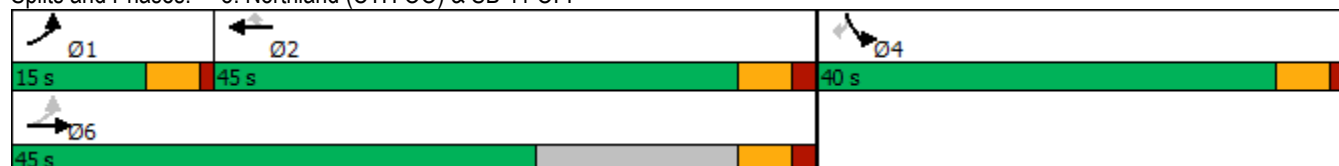
Intersection LOS: F

Intersection Capacity Utilization 96.5%

ICU Level of Service F

Analysis Period (min) 15

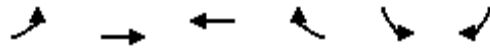
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	280	1560	810	460	230	1090
Future Volume (veh/h)	280	1560	810	460	230	1090
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	368	2053	1066	0	303	0
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	467	2242	1450		436	
Arrive On Green	0.16	0.63	0.41	0.00	0.24	0.00
Sat Flow, veh/h	1781	3647	3618	1572	1781	1585
Grp Volume(v), veh/h	368	2053	1066	0	303	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1763	1572	1781	1585
Q Serve(g_s), s	7.0	32.5	16.4	0.0	10.0	0.0
Cycle Q Clear(g_c), s	7.0	32.5	16.4	0.0	10.0	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	467	2242	1450		436	
V/C Ratio(X)	0.79	0.92	0.74		0.69	
Avail Cap(c_a), veh/h	491	2263	2245		996	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	12.0	10.4	16.0	0.0	22.1	0.0
Incr Delay (d2), s/veh	8.1	6.5	0.7	0.0	2.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	11.1	6.0	0.0	4.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.0	16.9	16.7	0.0	25.0	0.0
LnGrp LOS	C	B	B		C	
Approach Vol, veh/h		2421	1066	A	303	A
Approach Delay, s/veh		17.3	16.7		25.0	
Approach LOS		B	B		C	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	14.1	30.5		19.8		44.6
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	10.0	39.0		34.0		39.0
Max Q Clear Time (g_c+I1), s	9.0	18.4		12.0		34.5
Green Ext Time (p_c), s	0.2	5.6		1.9		4.1

Intersection Summary

HCM 6th Ctrl Delay	17.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	810	980	0	0	1000	170	270	0	490	0	0	0
Future Volume (vph)	810	980	0	0	1000	170	270	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	3574	0	0	3539	1583	0	1671	1495	0	0	0
Flt Permitted	0.103							0.950				
Satd. Flow (perm)	194	3574	0	0	3539	1583	0	1671	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						224			97			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	1066	1289	0	0	1316	224	355	0	645	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1066	1289	0	0	1316	224	0	355	645	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0	10.0			
Minimum Split (s)	12.0	26.0			36.0	36.0	20.0	20.0	20.0			

7:00 am Baseline

Synchro 10 Report
Page 7

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	40.0			40.0	40.0	25.0	25.0	25.0			
Total Split (%)	27.8%	44.4%			44.4%	44.4%	27.8%	27.8%	27.8%			
Maximum Green (s)	20.0	34.0			34.0	34.0	19.0	19.0	19.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lead/Lag	Lead				Lag				Lag			
Lead-Lag Optimize?	Yes				Yes				Yes			
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0	4.0			
Recall Mode	None	Min			Min	Min	None	None	None			
Act Effct Green (s)	61.0	61.0			36.0	36.0		21.0	21.0			
Actuated g/C Ratio	0.68	0.68			0.40	0.40		0.23	0.23			
v/c Ratio	2.12	0.53			0.93	0.29		0.91	1.52			
Control Delay	530.7	8.3			38.9	3.6		63.7	272.9			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	530.7	8.3			38.9	3.6		63.7	272.9			
LOS	F	A			D	A		E	F			
Approach Delay	244.8				33.8				198.6			
Approach LOS	F				C				F			

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 130

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 2.12

Intersection Signal Delay: 169.0

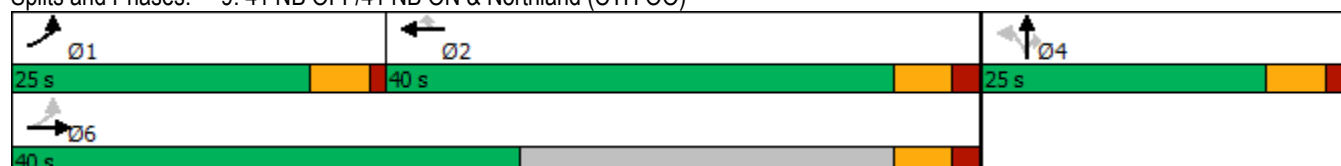
Intersection LOS: F

Intersection Capacity Utilization 97.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR				
Lane Configurations																
Traffic Volume (veh/h)	810	980	0	0	1000	170	270	0	490	0	0	0				
Future Volume (veh/h)	810	980	0	0	1000	170	270	0	490	0	0	0				
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0							
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00							
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00							
Work Zone On Approach	No			No			No									
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781							
Adj Flow Rate, veh/h	1066	1289	0	0	1316	0	355	0	0							
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76							
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8							
Cap, veh/h	514	2427	0	0	1420		396	0								
Arrive On Green	0.23	0.68	0.00	0.00	0.40	0.00	0.23	0.00	0.00							
Sat Flow, veh/h	1795	3676	0	0	3647	1585	1697	0	1510							
Grp Volume(v), veh/h	1066	1289	0	0	1316	0	355	0	0							
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1777	1585	1697	0	1510							
Q Serve(g_s), s	21.0	16.3	0.0	0.0	31.8	0.0	18.2	0.0	0.0							
Cycle Q Clear(g_c), s	21.0	16.3	0.0	0.0	31.8	0.0	18.2	0.0	0.0							
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00							
Lane Grp Cap(c), veh/h	514	2427	0	0	1420		396	0								
V/C Ratio(X)	2.07	0.53	0.00	0.00	0.93		0.90	0.00								
Avail Cap(c_a), veh/h	514	2427	0	0	1422		396	0								
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00							
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00							
Uniform Delay (d), s/veh	26.6	7.3	0.0	0.0	25.7	0.0	33.4	0.0	0.0							
Incr Delay (d2), s/veh	489.7	0.2	0.0	0.0	10.8	0.0	22.6	0.0	0.0							
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0							
%ile BackOfQ(50%),veh/ln	80.7	5.3	0.0	0.0	14.8	0.0	9.8	0.0	0.0							
Unsig. Movement Delay, s/veh																
LnGrp Delay(d),s/veh	516.3	7.5	0.0	0.0	36.5	0.0	56.1	0.0	0.0							
LnGrp LOS	F	A	A	A	D		E	A								
Approach Vol, veh/h	2355				1316		A		355		A					
Approach Delay, s/veh	237.8				36.5				56.1							
Approach LOS	F				D				E							
Timer - Assigned Phs	1	2	4		6											
Phs Duration (G+Y+Rc), s	25.0	40.0	25.0		65.0											
Change Period (Y+Rc), s	5.0	6.0	6.0		6.0											
Max Green Setting (Gmax), s	20.0	34.0	19.0		34.0											
Max Q Clear Time (g_c+I1), s	23.0	33.8	20.2		18.3											
Green Ext Time (p_c), s	0.0	0.2	0.0		6.3											

Intersection Summary

HCM 6th Ctrl Delay	156.0
HCM 6th LOS	F

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frts						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	410	0	160	0	0	0	0	700	440	410	710	0
Future Volume (vph)	410	0	160	0	0	0	0	700	440	410	710	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.143		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3539	1583	269	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			229						489			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	456	0	178	0	0	0	0	778	489	456	789	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	456	0	178	0	0	0	0	778	489	456	789	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effct Green (s)	20.9		20.9					26.0	26.0	71.1	71.1	
Actuated g/C Ratio	0.21		0.21					0.26	0.26	0.71	0.71	
v/c Ratio	0.63		0.35					0.85	0.63	0.56	0.31	
Control Delay	39.7		3.5					45.1	7.0	8.2	0.2	
Queue Delay	0.0		0.0					0.0	0.0	0.2	0.0	
Total Delay	39.7		3.5					45.1	7.0	8.4	0.2	
LOS	D		A					D	A	A	A	
Approach Delay		29.6						30.4			3.2	
Approach LOS		C						C			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 19.5

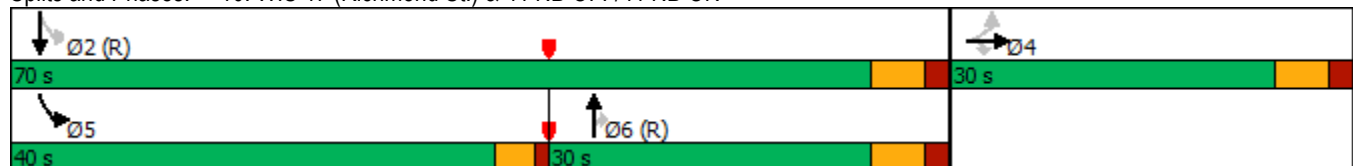
Intersection LOS: B

Intersection Capacity Utilization 85.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	410	0	160	0	0	0	0	700	440	410	710	0
Future Volume (veh/h)	410	0	160	0	0	0	0	700	440	410	710	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	456	0	0				0	778	0	456	789	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1				0	2	2	1	1	0
Cap, veh/h	624	338					0	1211		814	2654	0
Arrive On Green	0.18	0.00	0.00				0.00	0.34	0.00	0.12	0.24	0.00
Sat Flow, veh/h	3483	1885	1598				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	456	0	0				0	778	0	456	789	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1777	1585	1795	1791	0
Q Serve(g_s), s	12.4	0.0	0.0				0.0	18.5	0.0	14.3	17.9	0.0
Cycle Q Clear(g_c), s	12.4	0.0	0.0				0.0	18.5	0.0	14.3	17.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	624	338					0	1211		814	2654	0
V/C Ratio(X)	0.73	0.00					0.00	0.64		0.56	0.30	0.00
Avail Cap(c_a), veh/h	906	490					0	1211		814	2654	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.56	0.56	0.00
Uniform Delay (d), s/veh	38.8	0.0	0.0				0.0	27.8	0.0	19.5	16.6	0.0
Incr Delay (d2), s/veh	1.7	0.0	0.0				0.0	2.6	0.0	1.6	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	0.0	0.0				0.0	8.1	0.0	7.0	8.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.5	0.0	0.0				0.0	30.4	0.0	21.0	16.7	0.0
LnGrp LOS	D	A					A	C		C	B	A
Approach Vol, veh/h	456		A					778	A	1245		
Approach Delay, s/veh	40.5							30.4		18.3		
Approach LOS	D							C		B		
Timer - Assigned Phs	2			4		5	6					
Phs Duration (G+Y+Rc), s	78.1			21.9		40.0	38.1					
Change Period (Y+Rc), s	6.0			6.0		4.0	6.0					
Max Green Setting (Gmax), s	64.0			24.0		36.0	24.0					
Max Q Clear Time (g_c+I1), s	19.9			14.4		16.3	20.5					
Green Ext Time (p_c), s	2.3			1.5		1.1	2.0					
Intersection Summary												
HCM 6th Ctrl Delay	26.2											
HCM 6th LOS	C											

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	280	0	340	460	650	0	0	840	680
Future Volume (vph)	0	0	0	280	0	340	460	650	0	0	840	680
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						250						565
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	322	0	391	529	747	0	0	966	782
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	322	0	391	529	747	0	0	966	782
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

7:00 am Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				19.3		19.3	72.7	72.7			32.0	32.0
Actuated g/C Ratio				0.19		0.19	0.73	0.73			0.32	0.32
v/c Ratio				0.49		0.77	0.72	0.29			0.85	0.88
Control Delay				37.6		23.9	12.3	1.1			40.6	21.6
Queue Delay				0.0		0.0	0.7	0.0			0.0	0.0
Total Delay				37.6		23.9	13.0	1.1			40.6	21.6
LOS				D		C	B	A			D	C
Approach Delay					30.1			6.0			32.1	
Approach LOS					C			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 22.8

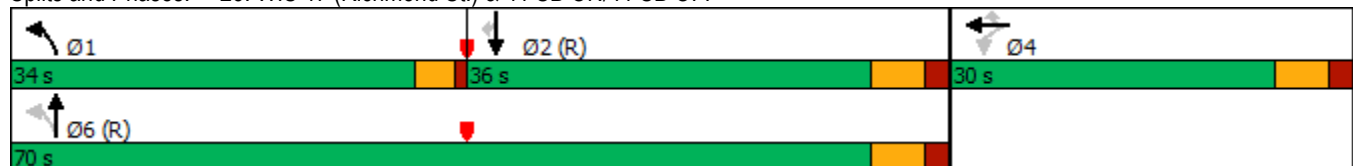
Intersection LOS: C

Intersection Capacity Utilization 85.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	280	0	340	460	650	0	0	840	680
Future Volume (veh/h)	0	0	0	280	0	340	460	650	0	0	840	680
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				322	0	0	529	747	0	0	966	0
Peak Hour Factor				0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				485	262		734	2793	0	0	1562	
Arrive On Green				0.14	0.00	0.00	0.60	1.00	0.00	0.00	0.44	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				322	0	0	529	747	0	0	966	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				8.8	0.0	0.0	10.7	0.0	0.0	0.0	20.9	0.0
Cycle Q Clear(g_c), s				8.8	0.0	0.0	10.7	0.0	0.0	0.0	20.9	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				485	262		734	2793	0	0	1562	
V/C Ratio(X)				0.66	0.00		0.72	0.27	0.00	0.00	0.62	
Avail Cap(c_a), veh/h				898	486		734	2793	0	0	1562	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.55	0.55	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				40.7	0.0	0.0	5.8	0.0	0.0	0.0	21.6	0.0
Incr Delay (d2), s/veh				1.6	0.0	0.0	3.4	0.1	0.0	0.0	1.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.8	0.0	0.0	2.9	0.1	0.0	0.0	8.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				42.3	0.0	0.0	9.2	0.1	0.0	0.0	23.4	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					322	A		1276			966	A
Approach Delay, s/veh					42.3			3.9			23.4	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	48.0		18.0		82.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	12.7	22.9		10.8		2.0						
Green Ext Time (p_c), s	1.3	4.4		1.2		2.2						

Intersection Summary

HCM 6th Ctrl Delay 16.1

HCM 6th LOS B

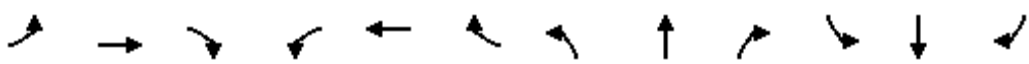
Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	240	0	920	160	1320	0	0	1150	760
Future Volume (vph)	0	0	0	240	0	920	160	1320	0	0	1150	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						780
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	289	0	1108	193	1590	0	0	1386	916
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	289	0	1108	193	1590	0	0	1386	916
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				26.0		26.0	66.0	66.0			32.0	32.0
Actuated g/C Ratio				0.26		0.26	0.66	0.66			0.32	0.32
v/c Ratio				0.32		2.37	0.31	0.67			1.22	0.88
Control Delay				31.1		644.4	11.3	3.5			140.7	17.0
Queue Delay				0.0		0.0	0.0	1.3			0.0	0.0
Total Delay				31.1		644.4	11.3	4.8			140.7	17.0
LOS				C		F	B	A			F	B
Approach Delay					517.5			5.6			91.5	
Approach LOS					F			A			F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.37

Intersection Signal Delay: 172.1

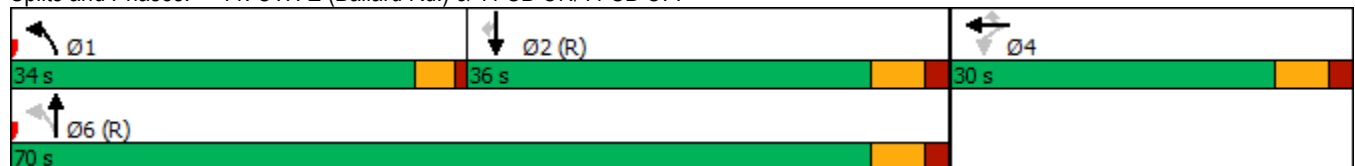
Intersection LOS: F

Intersection Capacity Utilization 109.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	240	0	920	160	1320	0	0	1150	760
Future Volume (veh/h)	0	0	0	240	0	920	160	1320	0	0	1150	760
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				289	0	0	193	1590	0	0	1386	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				898	486		611	2364	0	0	1137	
Arrive On Green				0.26	0.00	0.00	0.10	0.22	0.00	0.00	0.43	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				289	0	0	193	1590	0	0	1386	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.8	0.0	0.0	5.9	40.7	0.0	0.0	32.0	0.0
Cycle Q Clear(g_c), s				6.8	0.0	0.0	5.9	40.7	0.0	0.0	32.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				898	486		611	2364	0	0	1137	
V/C Ratio(X)				0.32	0.00		0.32	0.67	0.00	0.00	1.22	
Avail Cap(c_a), veh/h				898	486		611	2364	0	0	1137	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.29	0.29	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				29.9	0.0	0.0	18.9	29.2	0.0	0.0	28.7	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	0.4	0.5	0.0	0.0	106.6	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.9	0.0	0.0	2.3	19.5	0.0	0.0	28.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.8	0.0	0.0	19.3	29.7	0.0	0.0	135.3	0.0
LnGrp LOS				C	A		B	C	A	A	F	
Approach Vol, veh/h					289	A		1783			1386	A
Approach Delay, s/veh					30.8			28.5			135.3	
Approach LOS					C			C			F	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	36.0		30.0		70.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	7.9	34.0		8.8		42.7						
Green Ext Time (p_c), s	0.4	0.0		1.6		5.7						

Intersection Summary

HCM 6th Ctrl Delay 71.5

HCM 6th LOS E

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	740	0	380	0	0	0	0	740	280	1040	350	0
Future Volume (vph)	740	0	380	0	0	0	0	740	280	1040	350	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850							0.850		
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.122		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3574	1599	230	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			525						318			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	841	0	432	0	0	0	0	841	318	1182	398	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	841	0	432	0	0	0	0	841	318	1182	398	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

7:00 am Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	26.0	26.0	26.0					36.0	36.0	38.0	74.0	
Total Split (%)	26.0%	26.0%	26.0%					36.0%	36.0%	38.0%	74.0%	
Maximum Green (s)	20.0	20.0	20.0					30.0	30.0	34.0	68.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	23.1		23.1					30.9	30.9	68.9	68.9	
Actuated g/C Ratio	0.23		0.23					0.31	0.31	0.69	0.69	
v/c Ratio	1.06		0.56					0.76	0.45	1.72	0.16	
Control Delay	88.4		4.0					36.2	5.1	340.9	0.0	
Queue Delay	0.0		0.0					0.0	0.0	0.1	0.0	
Total Delay	88.4		4.0					36.2	5.1	341.0	0.0	
LOS	F		A					D	A	F	A	
Approach Delay		59.7						27.7			255.1	
Approach LOS		E						C			F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 10 (10%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.72

Intersection Signal Delay: 127.4

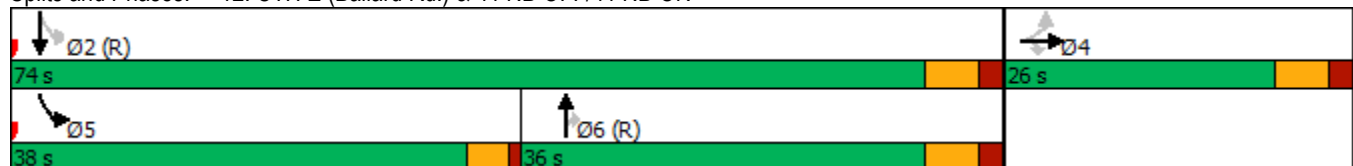
Intersection LOS: F

Intersection Capacity Utilization 109.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 		 	 	
Traffic Volume (veh/h)	740	0	380	0	0	0	0	740	280	1040	350	0
Future Volume (veh/h)	740	0	380	0	0	0	0	740	280	1040	350	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	841	0	0				0	841	0	1182	398	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	760	411					0	1146		775	2507	0
Arrive On Green	0.22	0.00	0.00				0.00	0.64	0.00	0.57	1.00	0.00
Sat Flow, veh/h	3456	1870	1585				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	841	0	0				0	841	0	1182	398	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1791	1598	1795	1791	0
Q Serve(g_s), s	22.0	0.0	0.0				0.0	15.9	0.0	34.0	0.0	0.0
Cycle Q Clear(g_c), s	22.0	0.0	0.0				0.0	15.9	0.0	34.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	760	411					0	1146		775	2507	0
V/C Ratio(X)	1.11	0.00					0.00	0.73		1.52	0.16	0.00
Avail Cap(c_a), veh/h	760	411					0	1146		775	2507	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	1.67	1.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.09	0.09	0.00
Uniform Delay (d), s/veh	39.0	0.0	0.0				0.0	15.1	0.0	10.2	0.0	0.0
Incr Delay (d2), s/veh	65.7	0.0	0.0				0.0	4.2	0.0	236.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.1	0.0	0.0				0.0	4.7	0.0	55.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	104.7	0.0	0.0				0.0	19.3	0.0	247.0	0.0	0.0
LnGrp LOS	F	A					A	B		F	A	A
Approach Vol, veh/h	841		A					841	A	1580		
Approach Delay, s/veh	104.7							19.3		184.8		
Approach LOS	F							B		F		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	74.0			26.0	38.0	36.0						
Change Period (Y+Rc), s	6.0			6.0	4.0	6.0						
Max Green Setting (Gmax), s	68.0			20.0	34.0	30.0						
Max Q Clear Time (g_c+I1), s	2.0			24.0	36.0	17.9						
Green Ext Time (p_c), s	1.1			0.0	0.0	4.7						
Intersection Summary												
HCM 6th Ctrl Delay			121.5									
HCM 6th LOS			F									
Notes												

Lanes, Volumes, Timings
13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↗	↕			↕	↗
Traffic Volume (vph)	0	0	0	140	0	130	320	350	0	0	300	370
Future Volume (vph)	0	0	0	140	0	130	320	350	0	0	300	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3505	1568
Flt Permitted					0.950		0.549					
Satd. Flow (perm)	0	0	0	0	1787	1599	1033	3574	0	0	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						146						416
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	0	0	157	0	146	360	393	0	0	337	416
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	157	146	360	393	0	0	337	416
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					13.2	13.2	37.4	37.4			22.5	22.5
Actuated g/C Ratio					0.23	0.23	0.64	0.64			0.38	0.38
v/c Ratio					0.39	0.31	0.45	0.17			0.25	0.48
Control Delay					22.6	6.0	8.8	4.7			13.3	3.9
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					22.6	6.0	8.8	4.7			13.3	3.9
LOS					C	A	A	A			B	A
Approach Delay					14.6			6.7			8.2	
Approach LOS					B			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 58.6

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 8.6

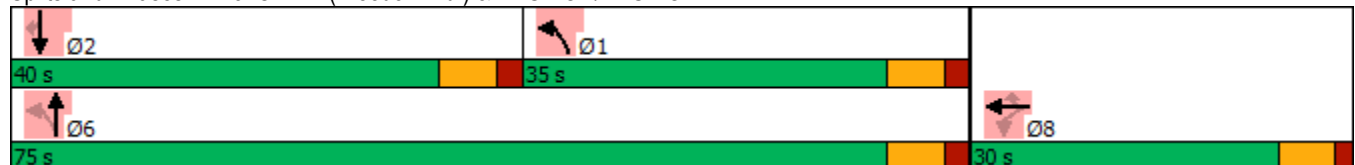
Intersection LOS: A

Intersection Capacity Utilization 59.0%

ICU Level of Service B

Analysis Period (min) 15

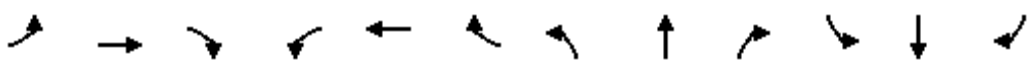
Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (veh/h)	0	0	0	140	0	130	320	350	0	0	300	370
Future Volume (veh/h)	0	0	0	140	0	130	320	350	0	0	300	370
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1856	1856
Adj Flow Rate, veh/h				157	0	0	360	393	0	0	337	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	3	3
Cap, veh/h				356	0		735	2361	0	0	1413	
Arrive On Green				0.20	0.00	0.00	0.19	0.66	0.00	0.00	0.40	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3618	1572
Grp Volume(v), veh/h				157	0	0	360	393	0	0	337	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1763	1572
Q Serve(g_s), s				4.3	0.0	0.0	0.0	2.4	0.0	0.0	3.6	0.0
Cycle Q Clear(g_c), s				4.3	0.0	0.0	0.0	2.4	0.0	0.0	3.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				356	0		735	2361	0	0	1413	
V/C Ratio(X)				0.44	0.00		0.49	0.17	0.00	0.00	0.24	
Avail Cap(c_a), veh/h				832	0		1390	4530	0	0	2261	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				19.8	0.0	0.0	13.1	3.7	0.0	0.0	11.1	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	0.7	0.0	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.7	0.0	0.0	3.3	0.5	0.0	0.0	1.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				20.6	0.0	0.0	13.8	3.7	0.0	0.0	11.3	0.0
LnGrp LOS				C	A		B	A	A	A	B	
Approach Vol, veh/h					157	A		753			337	A
Approach Delay, s/veh					20.6			8.5			11.3	
Approach LOS					C			A			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		15.1				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.0	5.6				4.4		6.3				
Green Ext Time (p_c), s	2.4	2.3				1.9		0.5				

Intersection Summary

HCM 6th Ctrl Delay	10.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	0	180	0	0	0	0	520	220	180	260	0
Future Volume (vph)	150	0	180	0	0	0	0	520	220	180	260	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1736	1553	0	0	0	0	3471	1553	1736	3471	0
Flt Permitted		0.950								0.386		
Satd. Flow (perm)	0	1736	1553	0	0	0	0	3471	1553	705	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196						168			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
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 (%)	4%	4%	4%	1%	1%	1%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	163	0	196	0	0	0	0	565	239	196	283	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	163	196	0	0	0	0	565	239	196	283	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effect Green (s)		13.9	13.9					22.6	22.6	37.5	37.5	
Actuated g/C Ratio		0.23	0.23					0.38	0.38	0.63	0.63	
v/c Ratio		0.40	0.38					0.43	0.34	0.31	0.13	
Control Delay		22.8	5.9					15.3	6.5	8.0	4.8	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		22.8	5.9					15.3	6.5	8.0	4.8	
LOS		C	A					B	A	A	A	
Approach Delay		13.6						12.7			6.1	
Approach LOS		B						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 59.4

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 11.0

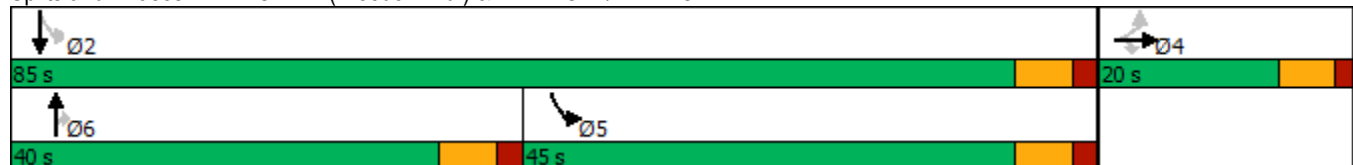
Intersection LOS: B

Intersection Capacity Utilization 59.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	0	180	0	0	0	0	520	220	180	260	0
Future Volume (veh/h)	150	0	180	0	0	0	0	520	220	180	260	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841				0	1841	1841	1841	1841	0
Adj Flow Rate, veh/h	163	0	0				0	565	0	196	283	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4				0	4	4	4	4	0
Cap, veh/h	350	0					0	1400		626	2302	0
Arrive On Green	0.20	0.00	0.00				0.00	0.40	0.00	0.19	0.66	0.00
Sat Flow, veh/h	1753	0	1560				0	3589	1560	1753	3589	0
Grp Volume(v), veh/h	163	0	0				0	565	0	196	283	0
Grp Sat Flow(s),veh/h/ln	1753	0	1560				0	1749	1560	1753	1749	0
Q Serve(g_s), s	4.6	0.0	0.0				0.0	6.5	0.0	0.0	1.7	0.0
Cycle Q Clear(g_c), s	4.6	0.0	0.0				0.0	6.5	0.0	0.0	1.7	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	350	0					0	1400		626	2302	0
V/C Ratio(X)	0.47	0.00					0.00	0.40		0.31	0.12	0.00
Avail Cap(c_a), veh/h	499	0					0	2240		1577	5040	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.9	0.0	0.0				0.0	12.1	0.0	13.6	3.6	0.0
Incr Delay (d2), s/veh	1.4	0.0	0.0				0.0	0.2	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	0.0				0.0	2.2	0.0	1.8	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.2	0.0	0.0				0.0	12.2	0.0	14.0	3.6	0.0
LnGrp LOS	C	A					A	B		B	A	A
Approach Vol, veh/h		163	A					565	A		479	
Approach Delay, s/veh		21.2						12.2			7.9	
Approach LOS		C						B			A	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		41.0		15.2	14.5	26.5						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		78.5		14.0	38.5	33.5						
Max Q Clear Time (g_c+I1), s		3.7		6.6	2.0	8.5						
Green Ext Time (p_c), s		1.3		0.5	1.3	2.7						

Intersection Summary

HCM 6th Ctrl Delay	11.7
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	150	0	120	90	150	0	0	390	100
Future Volume (vph)	0	0	0	150	0	120	90	150	0	0	390	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.940							0.850
Flt Protected					0.973		0.950					
Satd. Flow (prot)	0	0	0	0	1704	0	1787	1881	0	0	1863	1583
Flt Permitted					0.973		0.950					
Satd. Flow (perm)	0	0	0	0	1704	0	1787	1881	0	0	1863	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
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
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	176	0	141	106	176	0	0	459	118
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	317	0	106	176	0	0	459	118
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.2%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	12.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	150	0	120	90	150	0	0	390	100
Future Vol, veh/h	0	0	0	150	0	120	90	150	0	0	390	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	2	2	2
Mvmt Flow	0	0	0	176	0	141	106	176	0	0	459	118
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				906	965	176	577	0	-	-	-	0
Stage 1				388	388	-	-	-	-	-	-	-
Stage 2				518	577	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.11	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.209	-	-	-	-	-
Pot Cap-1 Maneuver				307	255	867	1001	-	0	0	-	-
Stage 1				686	609	-	-	-	0	0	-	-
Stage 2				598	502	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				274	0	867	1001	-	-	-	-	-
Mov Cap-2 Maneuver				274	0	-	-	-	-	-	-	-
Stage 1				613	0	-	-	-	-	-	-	-
Stage 2				598	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				42.8		3.4		0				
HCM LOS				E								
Minor Lane/Major Mvmt	NBL	NBT	WBLn1	SBT	SBR							
Capacity (veh/h)	1001	-	394	-	-							
HCM Lane V/C Ratio	0.106	-	0.806	-	-							
HCM Control Delay (s)	9	-	42.8	-	-							
HCM Lane LOS	A	-	E	-	-							
HCM 95th %tile Q(veh)	0.4	-	7.1	-	-							

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	0	90	0	0	0	0	160	380	110	430	0
Future Volume (vph)	80	0	90	0	0	0	0	160	380	110	430	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.929							0.850			
Flt Protected		0.977								0.950		
Satd. Flow (prot)	0	1642	0	0	0	0	0	1863	1583	1787	1881	0
Flt Permitted		0.977								0.950		
Satd. Flow (perm)	0	1642	0	0	0	0	0	1863	1583	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	91	0	102	0	0	0	0	182	432	125	489	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	193	0	0	0	0	0	182	432	125	489	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.2%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	5.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕						↑	↗	↘	↑	
Traffic Vol, veh/h	80	0	90	0	0	0	0	160	380	110	430	0
Future Vol, veh/h	80	0	90	0	0	0	0	160	380	110	430	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	2	2	2	1	1	1
Mvmt Flow	91	0	102	0	0	0	0	182	432	125	489	0
Major/Minor	Minor2						Major1		Major2			
Conflicting Flow All	1137	1353	489				-	0	0	614	0	0
Stage 1	739	739	-				-	-	-	-	-	-
Stage 2	398	614	-				-	-	-	-	-	-
Critical Hdwy	6.45	6.55	6.25				-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.45	5.55	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-				-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345				-	-	-	2.209	-	-
Pot Cap-1 Maneuver	220	148	573				0	-	-	970	-	0
Stage 1	467	419	-				0	-	-	-	-	0
Stage 2	672	478	-				0	-	-	-	-	0
Platoon blocked, %								-	-	-		
Mov Cap-1 Maneuver	192	0	573				-	-	-	970	-	-
Mov Cap-2 Maneuver	192	0	-				-	-	-	-	-	-
Stage 1	407	0	-				-	-	-	-	-	-
Stage 2	672	0	-				-	-	-	-	-	-
Approach	EB						NB		SB			
HCM Control Delay, s	37.4						0		1.9			
HCM LOS	E											
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	SBL	SBT						
Capacity (veh/h)		-	-	296	970	-						
HCM Lane V/C Ratio		-	-	0.653	0.129	-						
HCM Control Delay (s)		-	-	37.4	9.3	-						
HCM Lane LOS		-	-	E	A	-						
HCM 95th %tile Q(veh)		-	-	4.2	0.4	-						

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	390	100	240	210	0	0	0	0	80	0	130
Future Volume (vph)	0	390	100	240	210	0	0	0	0	80	0	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	459	118	282	247	0	0	0	0	94	0	153
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	459	118	282	247	0	0	0	0	0	94	153
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

Intersection												
Int Delay, s/veh	9.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕	↕	↕						↕	↕
Traffic Vol, veh/h	0	390	100	240	210	0	0	0	0	80	0	130
Future Vol, veh/h	0	390	100	240	210	0	0	0	0	80	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	459	118	282	247	0	0	0	0	94	0	153
Major/Minor	Major1		Major2				Minor2					
Conflicting Flow All	-	0	0	577	0	0				1329	1388	247
Stage 1	-	-	-	-	-	-				811	811	-
Stage 2	-	-	-	-	-	-				518	577	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1001	-	0				171	143	792
Stage 1	0	-	-	-	-	0				437	393	-
Stage 2	0	-	-	-	-	0				598	502	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	-	-	-	1001	-	-				123	0	792
Mov Cap-2 Maneuver	-	-	-	-	-	-				123	0	-
Stage 1	-	-	-	-	-	-				314	0	-
Stage 2	-	-	-	-	-	-				598	0	-
Approach	EB		WB				SB					
HCM Control Delay, s	0		5.3				42.7					
HCM LOS	E											
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1001	-	123	792						
HCM Lane V/C Ratio	-	-	0.282	-	0.765	0.193						
HCM Control Delay (s)	-	-	10	-	94.9	10.6						
HCM Lane LOS	-	-	B	-	F	B						
HCM 95th %tile Q(veh)	-	-	1.2	-	4.4	0.7						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	160	0	0	390	190	60	0	160	0	0	0
Future Volume (vph)	310	160	0	0	390	190	60	0	160	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	352	182	0	0	443	216	68	0	182	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	352	182	0	0	443	216	0	68	182	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	9.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	310	160	0	0	390	190	60	0	160	0	0	0
Future Vol, veh/h	310	160	0	0	390	190	60	0	160	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	352	182	0	0	443	216	68	0	182	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	659	0	-	-	-	0	1437	1545	182
Stage 1	-	-	-	-	-	-	886	886	-
Stage 2	-	-	-	-	-	-	551	659	-
Critical Hdwy	4.11	-	-	-	-	-	6.45	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45	5.55	-
Follow-up Hdwy	2.209	-	-	-	-	-	3.545	4.045	3.345
Pot Cap-1 Maneuver	934	-	0	0	-	-	145	113	853
Stage 1	-	-	0	0	-	-	398	359	-
Stage 2	-	-	0	0	-	-	571	456	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	934	-	-	-	-	-	90	0	853
Mov Cap-2 Maneuver	-	-	-	-	-	-	90	0	-
Stage 1	-	-	-	-	-	-	248	0	-
Stage 2	-	-	-	-	-	-	571	0	-

Approach	EB	WB	NB
HCM Control Delay, s	7.4	0	40.1
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR
Capacity (veh/h)	90	853	934	-	-	-
HCM Lane V/C Ratio	0.758	0.213	0.377	-	-	-
HCM Control Delay (s)	119.3	10.4	11.2	-	-	-
HCM Lane LOS	F	B	B	-	-	-
HCM 95th %tile Q(veh)	3.9	0.8	1.8	-	-	-

APPENDIX O7

Year 2048 No Build Synchro PM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	1020	440	340	430	0	0	0	0	180	0	370
Future Volume (vph)	0	1020	440	340	430	0	0	0	0	180	0	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1827	1553	1719	1810	0	0	0	0	0	1787	1599
Flt Permitted				0.105							0.950	
Satd. Flow (perm)	0	1827	1553	190	1810	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			259									284
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1229	530	410	518	0	0	0	0	217	0	446
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1229	530	410	518	0	0	0	0	0	217	446
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		38.0	38.0	16.0	54.0					46.0	46.0	46.0
Total Split (%)		38.0%	38.0%	16.0%	54.0%					46.0%	46.0%	46.0%
Maximum Green (s)		31.5	31.5	9.5	47.5					40.0	40.0	40.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		34.2	34.2	50.4	50.4						18.6	18.6
Actuated g/C Ratio		0.44	0.44	0.65	0.65						0.24	0.24
v/c Ratio		1.51	0.64	1.13	0.44						0.50	0.74
Control Delay		260.0	13.1	115.2	9.1						28.9	17.5
Queue Delay		0.0	0.0	0.0	0.7						0.0	0.0
Total Delay		260.0	13.1	115.2	9.8						28.9	17.5
LOS		F	B	F	A						C	B
Approach Delay		185.6			56.4						21.3	
Approach LOS		F			E						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 77

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.51

Intersection Signal Delay: 117.3

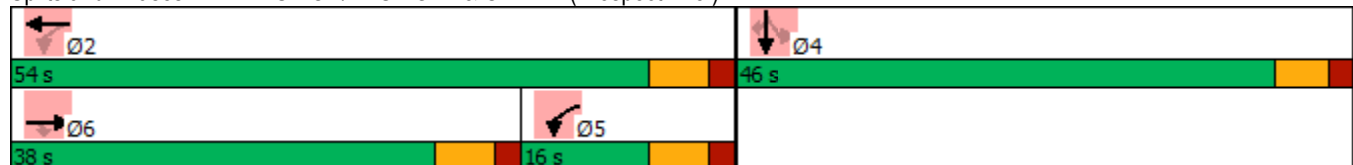
Intersection LOS: F

Intersection Capacity Utilization 92.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

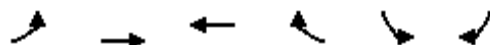
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (veh/h)	0	1020	440	340	430	0	0	0	0	180	0	370
Future Volume (veh/h)	0	1020	440	340	430	0	0	0	0	180	0	370
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1826	1826	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1229	530	410	518	0				217	0	446
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	4	4	5	5	0				1	1	1
Cap, veh/h	0	717	608	322	1046	0				602	0	536
Arrive On Green	0.00	0.39	0.39	0.14	0.57	0.00				0.34	0.00	0.34
Sat Flow, veh/h	0	1841	1560	1739	1826	0				1795	0	1598
Grp Volume(v), veh/h	0	1229	530	410	518	0				217	0	446
Grp Sat Flow(s),veh/h/ln	0	1841	1560	1739	1826	0				1795	0	1598
Q Serve(g_s), s	0.0	34.0	27.4	12.0	14.8	0.0				8.0	0.0	22.5
Cycle Q Clear(g_c), s	0.0	34.0	27.4	12.0	14.8	0.0				8.0	0.0	22.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	717	608	322	1046	0				602	0	536
V/C Ratio(X)	0.00	1.71	0.87	1.27	0.50	0.00				0.36	0.00	0.83
Avail Cap(c_a), veh/h	0	717	608	322	1046	0				864	0	769
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	26.6	24.6	36.1	11.1	0.0				21.9	0.0	26.7
Incr Delay (d2), s/veh	0.0	327.2	13.5	145.8	0.5	0.0				0.4	0.0	5.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	79.2	11.8	19.7	5.5	0.0				3.3	0.0	18.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	353.9	38.1	181.9	11.6	0.0				22.3	0.0	32.0
LnGrp LOS	A	F	D	F	B	A				C	A	C
Approach Vol, veh/h		1759			928						663	
Approach Delay, s/veh		258.7			86.9						28.9	
Approach LOS		F			F						C	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		54.0		33.3	16.0	38.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		47.5		40.0	9.5	31.5						
Max Q Clear Time (g_c+I1), s		16.8		24.5	14.0	36.0						
Green Ext Time (p_c), s		3.8		2.8	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			165.6									
HCM 6th LOS			F									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	780	420	770	180	0	0
Future Volume (vph)	780	420	770	180	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1845	1568	0	0
Flt Permitted	0.132					
Satd. Flow (perm)	246	1863	1845	1568	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				186		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	3%	3%	1%	1%
Adj. Flow (vph)	804	433	794	186	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	804	433	794	186	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0		
Minimum Split (s)	13.5	26.5	26.5	26.5		

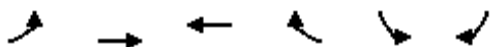
5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	58.9	62.9	26.2	26.2		
Actuated g/C Ratio	0.94	1.00	0.42	0.42		
v/c Ratio	0.87	0.23	1.03	0.24		
Control Delay	23.2	0.3	64.9	3.5		
Queue Delay	0.4	0.0	0.0	0.0		
Total Delay	23.6	0.3	64.9	3.5		
LOS	C	A	E	A		
Approach Delay		15.4	53.3			
Approach LOS		B	D			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 62.9

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 32.1

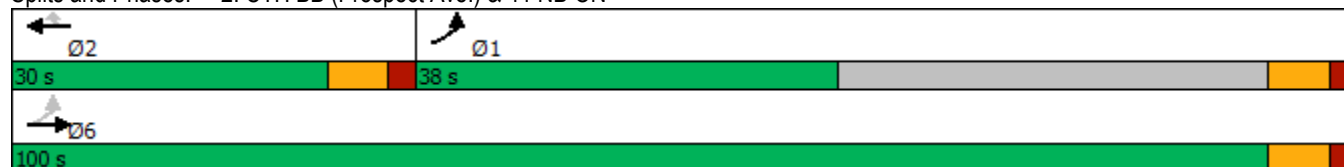
Intersection LOS: C

Intersection Capacity Utilization 92.5%

ICU Level of Service F

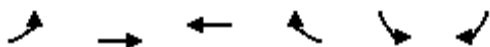
Analysis Period (min) 15

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary 2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	780	420	770	180	0	0
Future Volume (veh/h)	780	420	770	180	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856		
Adj Flow Rate, veh/h	804	433	794	186		
Peak Hour Factor	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	3	3		
Cap, veh/h	920	1750	778	660		
Arrive On Green	0.45	0.94	0.42	0.42		
Sat Flow, veh/h	1781	1870	1856	1572		
Grp Volume(v), veh/h	804	433	794	186		
Grp Sat Flow(s),veh/h/ln	1781	1870	1856	1572		
Q Serve(g_s), s	20.6	1.2	26.0	4.8		
Cycle Q Clear(g_c), s	20.6	1.2	26.0	4.8		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	920	1750	778	660		
V/C Ratio(X)	0.87	0.25	1.02	0.28		
Avail Cap(c_a), veh/h	1093	2897	778	660		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	13.5	0.2	18.0	11.8		
Incr Delay (d2), s/veh	7.0	0.1	37.4	0.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	8.1	0.1	17.6	1.6		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.5	0.3	55.4	12.2		
LnGrp LOS	C	A	F	B		
Approach Vol, veh/h		1237	980			
Approach Delay, s/veh		13.4	47.2			
Approach LOS		B	D			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	32.0	30.0			62.0	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	22.6	28.0			3.2	
Green Ext Time (p_c), s	2.9	0.0			3.2	
Intersection Summary						
HCM 6th Ctrl Delay			28.4			
HCM 6th LOS			C			

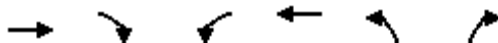
Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	420	0	0	740	210	410
Future Volume (vph)	420	0	0	740	210	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1845	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1845	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						340
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Adj. Flow (vph)	494	0	0	871	247	482
Shared Lane Traffic (%)						
Lane Group Flow (vph)	494	0	0	871	247	482
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Act Effect Green (s)	41.7			41.7	20.2	20.2
Actuated g/C Ratio	0.59			0.59	0.29	0.29
v/c Ratio	0.45			0.80	0.49	0.69
Control Delay	10.1			18.9	26.5	13.6
Queue Delay	0.1			0.0	0.0	0.0
Total Delay	10.2			18.9	26.5	13.6
LOS	B			B	C	B
Approach Delay	10.2			18.9	17.9	
Approach LOS	B			B	B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 70.5

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 16.5

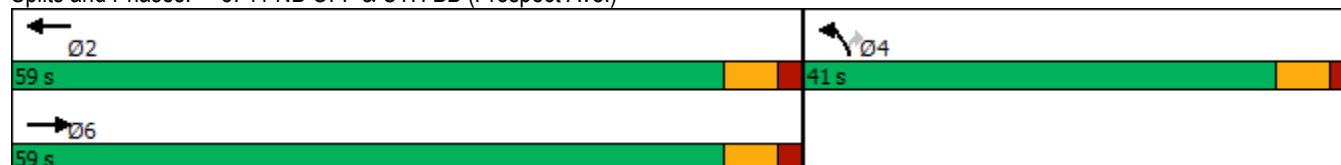
Intersection LOS: B

Intersection Capacity Utilization 57.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	420	0	0	740	210	410
Future Volume (veh/h)	420	0	0	740	210	410
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1856	1870	1870
Adj Flow Rate, veh/h	494	0	0	871	247	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	0	3	2	2
Cap, veh/h	1125	0	0	1116	421	
Arrive On Green	0.60	0.00	0.00	0.60	0.24	0.00
Sat Flow, veh/h	1870	0	0	1856	1781	1585
Grp Volume(v), veh/h	494	0	0	871	247	0
Grp Sat Flow(s),veh/h/ln	1870	0	0	1856	1781	1585
Q Serve(g_s), s	7.1	0.0	0.0	17.4	6.1	0.0
Cycle Q Clear(g_c), s	7.1	0.0	0.0	17.4	6.1	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1125	0	0	1116	421	
V/C Ratio(X)	0.44	0.00	0.00	0.78	0.59	
Avail Cap(c_a), veh/h	2085	0	0	2069	1336	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.3	0.0	0.0	7.4	16.7	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.7	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.0	4.8	2.3	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.7	0.0	0.0	9.1	18.0	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	494			871	247	A
Approach Delay, s/veh	5.7			9.1	18.0	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	33.7		15.7		33.7	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	19.4		8.1		9.1	
Green Ext Time (p_c), s	8.3		1.0		3.7	
Intersection Summary						
HCM 6th Ctrl Delay			9.4			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	1570	630	440	1550	0	0	0	0	220	0	270
Future Volume (vph)	0	1570	630	440	1550	0	0	0	0	220	0	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0		0	450		450
Storage Lanes	0		1	1		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			497									99
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	1635	656	458	1615	0	0	0	0	229	0	281
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	1635	656	458	1615	0	0	0	0	0	229	281
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	4.0	5.0					5.0	5.0	5.0
Minimum Split (s)		9.0	9.0	10.0	10.0					11.0	11.0	11.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	72.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	1.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-1.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		1.00	0.78	0.69	0.62					0.72	0.47	0.47
Control Delay		58.1	14.8	42.3	14.1					52.6	25.8	25.8
Queue Delay		0.0	0.0	0.0	0.1					0.0	0.0	0.0
Total Delay		58.1	14.8	42.3	14.2					52.6	25.8	25.8
LOS		E	B	D	B					D	C	C
Approach Delay		45.7			20.4					37.8		
Approach LOS		D			C					D		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 34.1

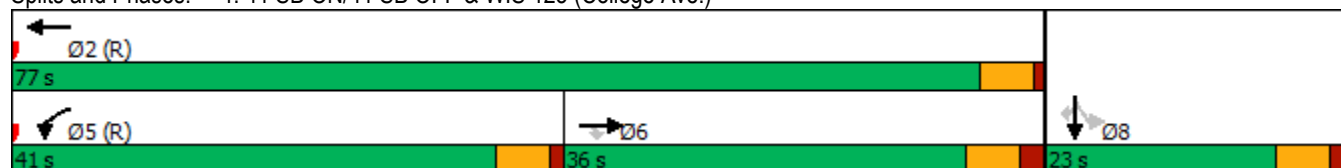
Intersection LOS: C

Intersection Capacity Utilization 92.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑					↖	↗	↗↗
Traffic Volume (veh/h)	0	1570	630	440	1550	0	0	0	0	220	0	270
Future Volume (veh/h)	0	1570	630	440	1550	0	0	0	0	220	0	270
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1856	1856	1856
Adj Flow Rate, veh/h	0	1635	0	458	1615	0				229	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	1	1	0				3	3	3
Cap, veh/h	0	2496		971	3797	0				672	0	
Arrive On Green	0.00	0.16	0.00	0.54	1.00	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1795	3676	0				3534	0	3145
Grp Volume(v), veh/h	0	1635	0	458	1615	0				229	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1795	1791	0				1767	0	1572
Q Serve(g_s), s	0.0	30.0	0.0	15.7	0.0	0.0				5.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	30.0	0.0	15.7	0.0	0.0				5.6	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2496		971	3797	0				672	0	
V/C Ratio(X)	0.00	0.65		0.47	0.43	0.00				0.34	0.00	
Avail Cap(c_a), veh/h	0	2496		971	3797	0				672	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	34.0	0.0	14.1	0.0	0.0				35.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.4	0.0	0.0	0.0	0.0				1.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	13.9	0.0	6.1	0.0	0.0				2.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	35.4	0.0	14.2	0.0	0.0				36.5	0.0	0.0
LnGrp LOS	A	D		B	A	A				D	A	
Approach Vol, veh/h		1635	A		2073						229	A
Approach Delay, s/veh		35.4			3.2						36.5	
Approach LOS		D			A						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		112.0			58.9	53.1		23.0				
Change Period (Y+Rc), s		* 6			5.0	6.0		6.0				
Max Green Setting (Gmax), s		* 72			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		2.0			17.7	32.0		7.6				
Green Ext Time (p_c), s		13.3			1.9	0.0		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			18.5									
HCM 6th LOS			B									
Notes												
User approved volume balancing among the lanes for turning movement.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	720	1070	0	0	1480	320	510	0	500	0	0	0
Future Volume (vph)	720	1070	0	0	1480	320	510	0	500	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.125						0.950					
Satd. Flow (perm)	235	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						330			189			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	742	1103	0	0	1526	330	526	0	515	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	742	1103	0	0	1526	330	526	0	515	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	67.0			32.0	32.0	33.0	33.0	33.0			
Total Split (%)	35.0%	67.0%			32.0%	32.0%	33.0%	33.0%	33.0%			
Maximum Green (s)	29.0	61.0			26.0	26.0	28.0	28.0	28.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	63.0	63.0			28.0	28.0	29.0		29.0			
Actuated g/C Ratio	0.63	0.63			0.28	0.28	0.29		0.29			
v/c Ratio	1.18	0.49			1.07	0.49	1.08		0.55			
Control Delay	123.8	27.4			81.3	5.9	99.5		20.9			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	123.8	27.4			81.3	5.9	99.5		20.9			
LOS	F	C			F	A	F		C			
Approach Delay	66.1				67.9		60.6					
Approach LOS	E				E		E					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 65.6

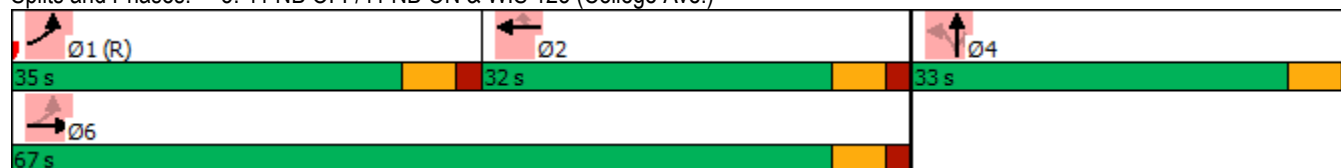
Intersection LOS: E

Intersection Capacity Utilization 92.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	720	1070	0	0	1480	320	510	0	500	0	0	0
Future Volume (veh/h)	720	1070	0	0	1480	320	510	0	500	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	742	1103	0	0	1526	0	526	0	0			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	629	2257	0	0	1430		1033	0				
Arrive On Green	0.31	0.63	0.00	0.00	0.09	0.00	0.29	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	742	1103	0	0	1526	0	526	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	31.0	16.5	0.0	0.0	28.0	0.0	12.3	0.0	0.0			
Cycle Q Clear(g_c), s	31.0	16.5	0.0	0.0	28.0	0.0	12.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	629	2257	0	0	1430		1033	0				
V/C Ratio(X)	1.18	0.49	0.00	0.00	1.07		0.51	0.00				
Avail Cap(c_a), veh/h	629	2257	0	0	1430		1033	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	28.3	9.9	0.0	0.0	45.4	0.0	29.6	0.0	0.0			
Incr Delay (d2), s/veh	82.9	0.1	0.0	0.0	44.0	0.0	1.8	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	29.1	5.9	0.0	0.0	18.6	0.0	5.4	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	111.1	10.0	0.0	0.0	89.4	0.0	31.4	0.0	0.0			
LnGrp LOS	F	A	A	A	F		C	A				
Approach Vol, veh/h	1845			1526			526			A		
Approach Delay, s/veh	50.6			89.4			31.4					
Approach LOS	D			F			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	35.0	32.0		33.0		67.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	26.0		28.0		61.0						
Max Q Clear Time (g_c+I1), s	33.0	30.0		14.3		18.5						
Green Ext Time (p_c), s	0.0	0.0		2.2		6.7						

Intersection Summary

HCM 6th Ctrl Delay 63.2

HCM 6th LOS E

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	1760	560	640	1790	0	0	0	0	220	0	610
Future Volume (vph)	0	1760	560	640	1790	0	0	0	0	220	0	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1787	1599
Flt Permitted				0.125							0.950	
Satd. Flow (perm)	0	5085	1583	233	3539	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			473									76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1796	571	653	1827	0	0	0	0	224	0	622
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1796	571	653	1827	0	0	0	0	0	224	622
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	70.0	70.0						22.0	22.0
Actuated g/C Ratio		0.30	0.30	0.70	0.70						0.22	0.22
v/c Ratio		1.18	0.71	0.91	0.74						0.57	1.51
Control Delay		120.1	11.3	10.8	6.5						41.4	270.6
Queue Delay		0.4	0.0	47.5	48.6						0.0	0.0
Total Delay		120.5	11.3	58.3	55.1						41.4	270.6
LOS		F	B	E	E						D	F
Approach Delay		94.2			56.0						209.9	
Approach LOS		F			E						F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.51

Intersection Signal Delay: 94.7

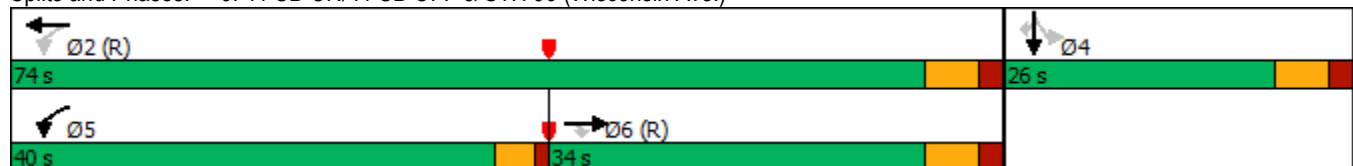
Intersection LOS: F

Intersection Capacity Utilization 140.7%

ICU Level of Service H

Analysis Period (min) 15

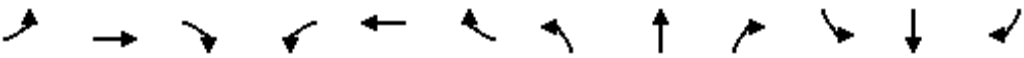
Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑						↖	↗
Traffic Volume (veh/h)	0	1760	560	640	1790	0	0	0	0	220	0	610
Future Volume (veh/h)	0	1760	560	640	1790	0	0	0	0	220	0	610
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1796	0	653	1827	0				224	0	622
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1532		713	2488	0				395	0	351
Arrive On Green	0.00	0.30	0.00	0.36	0.70	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1795	0	1598
Grp Volume(v), veh/h	0	1796	0	653	1827	0				224	0	622
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1795	0	1598
Q Serve(g_s), s	0.0	30.0	0.0	30.7	31.7	0.0				11.1	0.0	22.0
Cycle Q Clear(g_c), s	0.0	30.0	0.0	30.7	31.7	0.0				11.1	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		713	2488	0				395	0	351
V/C Ratio(X)	0.00	1.17		0.92	0.73	0.00				0.57	0.00	1.77
Avail Cap(c_a), veh/h	0	1532		713	2488	0				395	0	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	35.0	0.0	24.9	9.3	0.0				34.8	0.0	39.0
Incr Delay (d2), s/veh	0.0	84.9	0.0	2.3	0.2	0.0				1.9	0.0	357.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	24.1	0.0	14.6	10.3	0.0				5.0	0.0	52.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	119.9	0.0	27.2	9.4	0.0				36.7	0.0	396.8
LnGrp LOS	A	F		C	A	A				D	A	F
Approach Vol, veh/h		1796	A		2480						846	
Approach Delay, s/veh		119.9			14.1						301.4	
Approach LOS		F			B						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		33.7		24.0	32.7	32.0						
Green Ext Time (p_c), s		21.0		0.0	0.7	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			98.7									
HCM 6th LOS			F									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	830	1150	0	0	1930	320	500	0	500	0	0	0
Future Volume (vph)	830	1150	0	0	1930	320	500	0	500	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.125						0.950					
Satd. Flow (perm)	233	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						327			119			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	847	1173	0	0	1969	327	510	0	510	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	847	1173	0	0	1969	327	510	0	510	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	1.18	0.47			1.29	0.47	1.38		1.16			
Control Delay	97.2	3.0			167.5	5.4	220.6		122.0			
Queue Delay	1.8	24.6			0.6	0.0	0.0		0.0			
Total Delay	99.0	27.6			168.1	5.4	220.6		122.0			
LOS	F	C			F	A	F		F			
Approach Delay	57.6				145.0		171.3					
Approach LOS	E				F		F					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.38

Intersection Signal Delay: 116.9

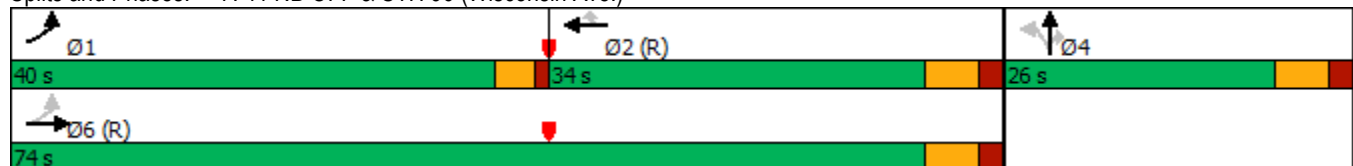
Intersection LOS: F

Intersection Capacity Utilization 140.7%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (veh/h)	830	1150	0	0	1930	320	500	0	500	0	0	0
Future Volume (veh/h)	830	1150	0	0	1930	320	500	0	500	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	847	1173	0	0	1969	327	510	0	0			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	713	2607	0	0	1704	529	664	0				
Arrive On Green	0.12	0.24	0.00	0.00	0.33	0.33	0.19	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	847	1173	0	0	1969	327	510	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	36.0	28.1	0.0	0.0	33.4	17.3	13.6	0.0	0.0			
Cycle Q Clear(g_c), s	36.0	28.1	0.0	0.0	33.4	17.3	13.6	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	713	2607	0	0	1704	529	664	0				
V/C Ratio(X)	1.19	0.45	0.00	0.00	1.16	0.62	0.77	0.00				
Avail Cap(c_a), veh/h	713	2607	0	0	1704	529	784	0				
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	39.2	20.7	0.0	0.0	33.3	28.0	38.6	0.0	0.0			
Incr Delay (d2), s/veh	85.8	0.1	0.0	0.0	77.2	5.3	3.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	36.0	13.3	0.0	0.0	25.5	7.2	6.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	124.9	20.8	0.0	0.0	110.5	33.3	42.6	0.0	0.0			
LnGrp LOS	F	C	A	A	F	C	D	A				
Approach Vol, veh/h	2020			2296			510			A		
Approach Delay, s/veh	64.5			99.5			42.6					
Approach LOS	E			F			D					
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	40.0	37.4	22.6		77.4							
Change Period (Y+Rc), s	4.0	6.0	6.0		6.0							
Max Green Setting (Gmax), s	36.0	28.0	20.0		68.0							
Max Q Clear Time (g_c+I1), s	38.0	35.4	15.6		30.1							
Green Ext Time (p_c), s	0.0	0.0	1.0		11.5							

Intersection Summary

HCM 6th Ctrl Delay 78.8

HCM 6th LOS E

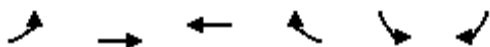
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019



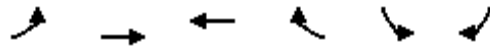
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	320	2150	1470	570	180	1200
Future Volume (vph)	320	2150	1470	570	180	1200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3574	1599	1752	1568
Flt Permitted	0.080				0.950	
Satd. Flow (perm)	149	3539	3574	1599	1752	1568
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				648		174
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	364	2443	1670	648	205	1364
Shared Lane Traffic (%)						
Lane Group Flow (vph)	364	2443	1670	648	205	1364
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	13.0	64.0	51.0	51.0	31.0	31.0
Total Split (%)	13.7%	67.4%	53.7%	53.7%	32.6%	32.6%
Maximum Green (s)	8.0	58.0	45.0	45.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	60.0	60.0	47.0	47.0	27.0	27.0
Actuated g/C Ratio	0.63	0.63	0.49	0.49	0.28	0.28
v/c Ratio	1.47	1.09	0.94	0.58	0.41	2.39
Control Delay	257.2	69.4	18.3	7.4	30.6	650.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	257.2	69.4	18.3	7.4	30.6	650.9
LOS	F	E	B	A	C	F
Approach Delay	93.7		15.2		569.9	
Approach LOS	F		B		F	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.39

Intersection Signal Delay: 178.2

Intersection LOS: F

Intersection Capacity Utilization 121.6%

ICU Level of Service H

Analysis Period (min) 15

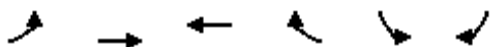
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	320	2150	1470	570	180	1200
Future Volume (veh/h)	320	2150	1470	570	180	1200
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	364	2443	1670	0	205	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	295	2683	2214		284	
Arrive On Green	0.19	1.00	0.20	0.00	0.16	0.00
Sat Flow, veh/h	1781	3647	3676	1598	1767	1572
Grp Volume(v), veh/h	364	2443	1670	0	205	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1767	1572
Q Serve(g_s), s	9.0	0.0	41.7	0.0	10.5	0.0
Cycle Q Clear(g_c), s	9.0	0.0	41.7	0.0	10.5	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	295	2683	2214		284	
V/C Ratio(X)	1.24	0.91	0.75		0.72	
Avail Cap(c_a), veh/h	295	2683	2214		502	
HCM Platoon Ratio	2.00	2.00	0.33	0.33	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	0.00
Uniform Delay (d), s/veh	24.0	0.0	31.0	0.0	37.8	0.0
Incr Delay (d2), s/veh	131.6	6.0	0.2	0.0	4.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.7	2.2	19.9	0.0	4.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	155.6	6.0	31.3	0.0	42.7	0.0
LnGrp LOS	F	A	C		D	
Approach Vol, veh/h		2807	1670	A	205	A
Approach Delay, s/veh		25.4	31.3		42.7	
Approach LOS		C	C		D	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	13.0	62.7		19.3		75.7
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	8.0	45.0		25.0		58.0
Max Q Clear Time (g_c+I1), s	11.0	43.7		12.5		2.0
Green Ext Time (p_c), s	0.0	1.1		0.9		43.0

Intersection Summary

HCM 6th Ctrl Delay	28.2
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Future Volume (vph)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1780	3574	0	0	3574	1599	0	1752	1568	0	0	0
Flt Permitted	0.125							0.950				
Satd. Flow (perm)	234	3574	0	0	3574	1599	0	1752	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						318			408			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
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
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	1326	1207	0	0	1761	370	457	0	978	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1326	1207	0	0	1761	370	0	457	978	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Free			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	31.0	64.0			33.0	33.0	31.0	31.0				
Total Split (%)	32.6%	67.4%			34.7%	34.7%	32.6%	32.6%				
Maximum Green (s)	26.0	58.0			27.0	27.0	25.0	25.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	60.1	60.1			29.0	29.0		26.9	95.0			
Actuated g/C Ratio	0.63	0.63			0.31	0.31		0.28	1.00			
v/c Ratio	2.26	0.53			1.61	0.52		0.92	0.62			
Control Delay	583.8	3.1			307.4	8.0		59.6	1.9			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	583.8	3.1			307.4	8.0		59.6	1.9			
LOS	F	A			F	A		E	A			
Approach Delay	307.1				255.4		20.3					
Approach LOS	F				F		C					

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 54 (57%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.26

Intersection Signal Delay: 221.5

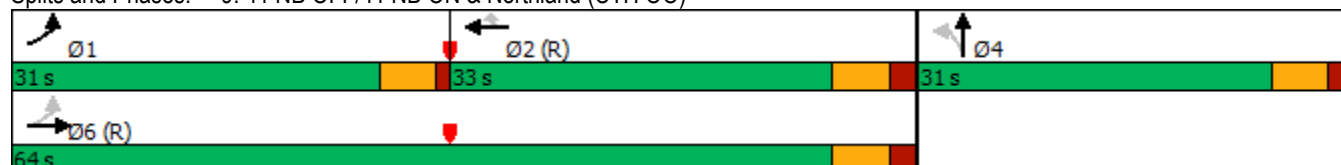
Intersection LOS: F

Intersection Capacity Utilization 145.6%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Future Volume (veh/h)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856			
Adj Flow Rate, veh/h	1326	1207	0	0	1761	0	457	0	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3			
Cap, veh/h	586	2262	0	0	1093		502	0				
Arrive On Green	0.47	1.00	0.00	0.00	0.10	0.00	0.28	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3676	1598	1767	0	1572			
Grp Volume(v), veh/h	1326	1207	0	0	1761	0	457	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1791	1598	1767	0	1572			
Q Serve(g_s), s	27.0	0.0	0.0	0.0	29.0	0.0	23.7	0.0	0.0			
Cycle Q Clear(g_c), s	27.0	0.0	0.0	0.0	29.0	0.0	23.7	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	586	2262	0	0	1093		502	0				
V/C Ratio(X)	2.26	0.53	0.00	0.00	1.61		0.91	0.00				
Avail Cap(c_a), veh/h	586	2262	0	0	1093		502	0				
HCM Platoon Ratio	1.67	1.67	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	18.3	0.0	0.0	0.0	42.7	0.0	32.8	0.0	0.0			
Incr Delay (d2), s/veh	568.6	0.1	0.0	0.0	279.0	0.0	20.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	101.8	0.0	0.0	0.0	56.2	0.0	12.8	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	586.9	0.1	0.0	0.0	321.7	0.0	53.7	0.0	0.0			
LnGrp LOS	F	A	A	A	F		D	A				
Approach Vol, veh/h	2533			1761			A	457			A	
Approach Delay, s/veh	307.3			321.7				53.7				
Approach LOS	F			F				D				
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	33.0		31.0		64.0						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	26.0	27.0		25.0		58.0						
Max Q Clear Time (g_c+I1), s	29.0	31.0		25.7		2.0						
Green Ext Time (p_c), s	0.0	0.0		0.0		7.8						
Intersection Summary												
HCM 6th Ctrl Delay			288.3									
HCM 6th LOS			F									
Notes												

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frts						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	710	0	290	0	0	0	0	1130	530	420	1240	0
Future Volume (vph)	710	0	290	0	0	0	0	1130	530	420	1240	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.143		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3539	1583	269	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76						469			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	763	0	312	0	0	0	0	1215	570	452	1333	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	763	0	312	0	0	0	0	1215	570	452	1333	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)	30.0	30.0	30.0					30.0	30.0	40.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					30.0%	30.0%	40.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					24.0	24.0	36.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effct Green (s)	25.7		25.7					26.0	26.0	66.3	66.3	
Actuated g/C Ratio	0.26		0.26					0.26	0.26	0.66	0.66	
v/c Ratio	0.87		0.67					1.32	0.75	0.62	0.56	
Control Delay	47.1		33.1					184.2	13.8	11.0	0.4	
Queue Delay	49.8		0.0					0.1	0.0	0.2	0.3	
Total Delay	96.9		33.1					184.2	13.8	11.2	0.7	
LOS	F		C					F	B	B	A	
Approach Delay		78.4						129.8			3.4	
Approach LOS		E						F			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 69.3

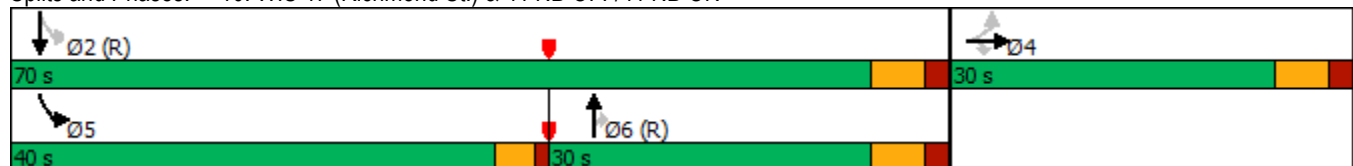
Intersection LOS: E

Intersection Capacity Utilization 86.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	710	0	290	0	0	0	0	1130	530	420	1240	0
Future Volume (veh/h)	710	0	290	0	0	0	0	1130	530	420	1240	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	763	0	0				0	1215	0	452	1333	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2				0	2	2	1	1	0
Cap, veh/h	881	477					0	942		718	2382	0
Arrive On Green	0.26	0.00	0.00				0.00	0.26	0.00	0.36	0.66	0.00
Sat Flow, veh/h	3456	1870	1585				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	763	0	0				0	1215	0	452	1333	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1777	1585	1795	1791	0
Q Serve(g_s), s	21.1	0.0	0.0				0.0	26.5	0.0	16.2	19.9	0.0
Cycle Q Clear(g_c), s	21.1	0.0	0.0				0.0	26.5	0.0	16.2	19.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	881	477					0	942		718	2382	0
V/C Ratio(X)	0.87	0.00					0.00	1.29		0.63	0.56	0.00
Avail Cap(c_a), veh/h	898	486					0	942		718	2382	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.21	0.21	0.00
Uniform Delay (d), s/veh	35.6	0.0	0.0				0.0	36.8	0.0	18.4	8.9	0.0
Incr Delay (d2), s/veh	8.8	0.0	0.0				0.0	138.7	0.0	0.9	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.8	0.0	0.0				0.0	29.4	0.0	8.5	6.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.4	0.0	0.0				0.0	175.4	0.0	19.3	9.1	0.0
LnGrp LOS	D	A					A	F		B	A	A
Approach Vol, veh/h	763			A			1215			A		
Approach Delay, s/veh	44.4						175.4			11.7		
Approach LOS	D						F			B		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	70.5			29.5			40.0			30.5		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	64.0			24.0			36.0			24.0		
Max Q Clear Time (g_c+I1), s	21.9			23.1			18.2			28.5		
Green Ext Time (p_c), s	4.7			0.4			1.0			0.0		
Intersection Summary												
HCM 6th Ctrl Delay	71.2											
HCM 6th LOS	E											

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	540	0	420	260	1580	0	0	1120	470
Future Volume (vph)	0	0	0	540	0	420	260	1580	0	0	1120	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						464
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	593	0	462	286	1736	0	0	1231	516
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	593	0	462	286	1736	0	0	1231	516
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

5:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				26.0		26.0	66.0	66.0			32.0	32.0
Actuated g/C Ratio				0.26		0.26	0.66	0.66			0.32	0.32
v/c Ratio				0.66		0.99	0.46	0.74			1.09	0.63
Control Delay				37.4		71.4	5.6	8.6			87.3	7.9
Queue Delay				0.0		0.0	0.0	29.2			0.0	0.0
Total Delay				37.4		71.4	5.6	37.8			87.3	7.9
LOS				D		E	A	D			F	A
Approach Delay					52.3			33.2			63.9	
Approach LOS					D			C			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 48.5

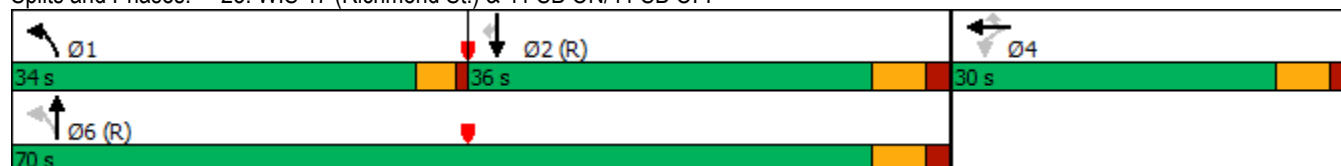
Intersection LOS: D

Intersection Capacity Utilization 86.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	540	0	420	260	1580	0	0	1120	470
Future Volume (veh/h)	0	0	0	540	0	420	260	1580	0	0	1120	470
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				593	0	0	286	1736	0	0	1231	0
Peak Hour Factor				0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				751	406		613	2517	0	0	1289	
Arrive On Green				0.22	0.00	0.00	0.30	0.70	0.00	0.00	0.36	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				593	0	0	286	1736	0	0	1231	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				16.2	0.0	0.0	8.3	28.0	0.0	0.0	33.8	0.0
Cycle Q Clear(g_c), s				16.2	0.0	0.0	8.3	28.0	0.0	0.0	33.8	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				751	406		613	2517	0	0	1289	
V/C Ratio(X)				0.79	0.00		0.47	0.69	0.00	0.00	0.96	
Avail Cap(c_a), veh/h				898	486		613	2517	0	0	1289	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.09	0.09	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				37.0	0.0	0.0	17.6	8.6	0.0	0.0	31.1	0.0
Incr Delay (d2), s/veh				4.0	0.0	0.0	0.2	0.1	0.0	0.0	16.4	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				7.2	0.0	0.0	5.3	9.1	0.0	0.0	16.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				41.0	0.0	0.0	17.8	8.7	0.0	0.0	47.5	0.0
LnGrp LOS				D	A		B	A	A	A	D	
Approach Vol, veh/h					593	A		2022			1231	A
Approach Delay, s/veh					41.0			10.0			47.5	
Approach LOS					D			B			D	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	40.3		25.7		74.3						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	10.3	35.8		18.2		30.0						
Green Ext Time (p_c), s	0.6	0.0		1.5		7.2						
Intersection Summary												
HCM 6th Ctrl Delay				26.8								
HCM 6th LOS				C								
Notes												
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	250	0	710	490	1340	0	0	1520	910
Future Volume (vph)	0	0	0	250	0	710	490	1340	0	0	1520	910
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3467	1881	1599	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.098					
Satd. Flow (perm)	0	0	0	3467	1881	1599	184	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						526
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	281	0	798	551	1506	0	0	1708	1022
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	281	0	798	551	1506	0	0	1708	1022
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				26.0	26.0	26.0	31.0	74.0			43.0	43.0
Total Split (%)				26.0%	26.0%	26.0%	31.0%	74.0%			43.0%	43.0%
Maximum Green (s)				20.0	20.0	20.0	27.0	68.0			37.0	37.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				22.0		22.0	70.0	70.0			39.0	39.0
Actuated g/C Ratio				0.22		0.22	0.70	0.70			0.39	0.39
v/c Ratio				0.37		1.94	0.98	0.60			1.24	1.09
Control Delay				34.8		456.0	26.6	8.5			142.6	73.3
Queue Delay				0.0		0.0	0.0	6.1			0.2	0.0
Total Delay				34.8		456.0	26.6	14.6			142.8	73.3
LOS				C		F	C	B			F	E
Approach Delay					346.3			17.9			116.7	
Approach LOS					F			B			F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 69 (69%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.94

Intersection Signal Delay: 124.3

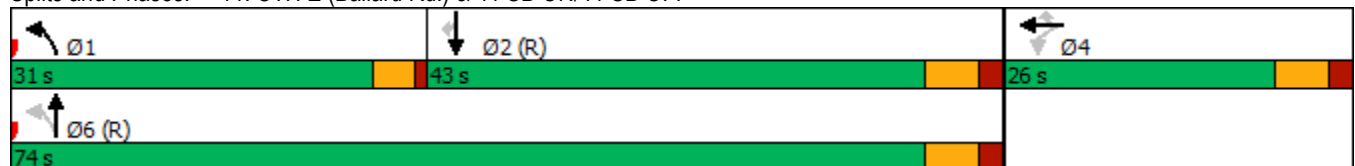
Intersection LOS: F

Intersection Capacity Utilization 101.8%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	250	0	710	490	1340	0	0	1520	910
Future Volume (veh/h)	0	0	0	250	0	710	490	1340	0	0	1520	910
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				281	0	0	551	1506	0	0	1708	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				766	415		557	2507	0	0	1386	
Arrive On Green				0.22	0.00	0.00	0.18	0.47	0.00	0.00	0.52	0.00
Sat Flow, veh/h				3483	1885	1598	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				281	0	0	551	1506	0	0	1708	0
Grp Sat Flow(s),veh/h/ln				1742	1885	1598	1795	1791	0	0	1777	1585
Q Serve(g_s), s				6.8	0.0	0.0	26.6	31.1	0.0	0.0	39.0	0.0
Cycle Q Clear(g_c), s				6.8	0.0	0.0	26.6	31.1	0.0	0.0	39.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				766	415		557	2507	0	0	1386	
V/C Ratio(X)				0.37	0.00		0.99	0.60	0.00	0.00	1.23	
Avail Cap(c_a), veh/h				766	415		557	2507	0	0	1386	
HCM Platoon Ratio				1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.09	0.09	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				33.1	0.0	0.0	34.6	16.2	0.0	0.0	24.1	0.0
Incr Delay (d2), s/veh				1.4	0.0	0.0	9.3	0.1	0.0	0.0	111.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.0	0.0	0.0	14.8	13.5	0.0	0.0	35.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				34.4	0.0	0.0	43.9	16.3	0.0	0.0	135.1	0.0
LnGrp LOS				C	A		D	B	A	A	F	
Approach Vol, veh/h					281	A		2057			1708	A
Approach Delay, s/veh					34.4			23.7			135.1	
Approach LOS					C			C			F	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	43.0		26.0		74.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	27.0	37.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	28.6	41.0		8.8		33.1						
Green Ext Time (p_c), s	0.0	0.0		1.3		5.7						

Intersection Summary

HCM 6th Ctrl Delay 71.5

HCM 6th LOS E

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	550	0	160	0	0	0	0	1280	200	730	1040	0
Future Volume (vph)	550	0	160	0	0	0	0	1280	200	730	1040	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.121		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3574	1599	228	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140						189			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	585	0	170	0	0	0	0	1362	213	777	1106	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	585	0	170	0	0	0	0	1362	213	777	1106	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

5:00 pm Baseline

Synchro 10 Report
Page 10

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 5 (5%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

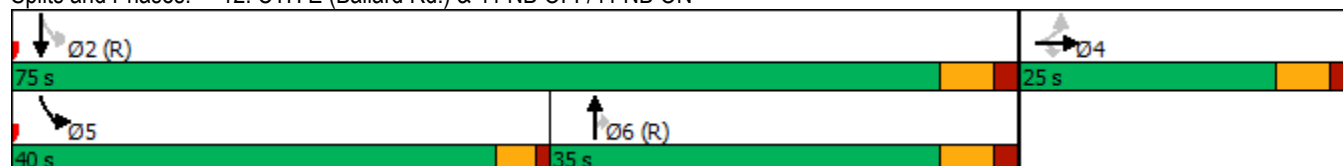
Maximum v/c Ratio: 1.23

Intersection Signal Delay: 66.3 Intersection LOS: E

Intersection Capacity Utilization 101.8%	ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



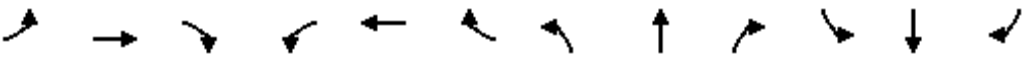
HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	0	160	0	0	0	0	1280	200	730	1040	0
Future Volume (veh/h)	550	0	160	0	0	0	0	1280	200	730	1040	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	585	0	0				0	1362	0	777	1106	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	731	396					0	1110		718	2543	0
Arrive On Green	0.21	0.00	0.00				0.00	0.62	0.00	0.12	0.23	0.00
Sat Flow, veh/h	3483	1885	1598				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	585	0	0				0	1362	0	777	1106	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1791	1598	1795	1791	0
Q Serve(g_s), s	15.9	0.0	0.0				0.0	31.0	0.0	36.0	26.3	0.0
Cycle Q Clear(g_c), s	15.9	0.0	0.0				0.0	31.0	0.0	36.0	26.3	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	731	396					0	1110		718	2543	0
V/C Ratio(X)	0.80	0.00					0.00	1.23		1.08	0.43	0.00
Avail Cap(c_a), veh/h	731	396					0	1110		718	2543	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.09	0.09	0.00
Uniform Delay (d), s/veh	37.5	0.0	0.0				0.0	19.0	0.0	38.9	21.2	0.0
Incr Delay (d2), s/veh	8.9	0.0	0.0				0.0	110.1	0.0	39.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	0.0	0.0				0.0	24.0	0.0	27.0	12.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.4	0.0	0.0				0.0	129.1	0.0	78.5	21.2	0.0
LnGrp LOS	D	A					A	F		F	C	A
Approach Vol, veh/h	585			A			1362			A		
Approach Delay, s/veh	46.4						129.1			44.8		
Approach LOS	D						F			D		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	75.0			25.0			40.0			35.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	69.0			19.0			36.0			29.0		
Max Q Clear Time (g_c+I1), s	28.3			17.9			38.0			33.0		
Green Ext Time (p_c), s	3.6			0.4			0.0			0.0		
Intersection Summary												
HCM 6th Ctrl Delay			75.1									
HCM 6th LOS			E									
Notes												

Lanes, Volumes, Timings
13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (vph)	0	0	0	420	0	230	360	710	0	0	450	270
Future Volume (vph)	0	0	0	420	0	230	360	710	0	0	450	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3574	1599
Flt Permitted					0.950		0.357					
Satd. Flow (perm)	0	0	0	0	1787	1599	672	3574	0	0	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						145						238
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	500	0	274	429	845	0	0	536	321
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	500	274	429	845	0	0	536	321
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					26.3	26.3	44.7	44.7			24.9	24.9
Actuated g/C Ratio					0.33	0.33	0.57	0.57			0.31	0.31
v/c Ratio					0.84	0.44	0.71	0.42			0.48	0.48
Control Delay					41.7	13.6	24.9	10.2			24.0	9.3
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					41.7	13.6	24.9	10.2			24.0	9.3
LOS					D	B	C	B			C	A
Approach Delay					31.7			15.1			18.5	
Approach LOS					C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 79.1

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 20.5

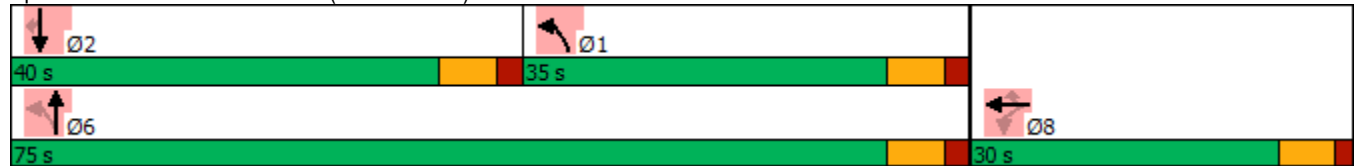
Intersection LOS: C

Intersection Capacity Utilization 69.9%

ICU Level of Service C

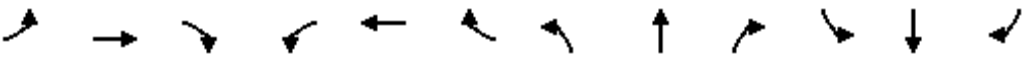
Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (veh/h)	0	0	0	420	0	230	360	710	0	0	450	270
Future Volume (veh/h)	0	0	0	420	0	230	360	710	0	0	450	270
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1885	1885
Adj Flow Rate, veh/h				500	0	0	429	845	0	0	536	0
Peak Hour Factor				0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %				1	1	1	1	1	0	0	1	1
Cap, veh/h				585	0		565	2019	0	0	1114	
Arrive On Green				0.33	0.00	0.00	0.20	0.56	0.00	0.00	0.31	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3676	1598
Grp Volume(v), veh/h				500	0	0	429	845	0	0	536	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1791	1598
Q Serve(g_s), s				18.8	0.0	0.0	7.0	9.7	0.0	0.0	8.8	0.0
Cycle Q Clear(g_c), s				18.8	0.0	0.0	7.0	9.7	0.0	0.0	8.8	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				585	0		565	2019	0	0	1114	
V/C Ratio(X)				0.85	0.00		0.76	0.42	0.00	0.00	0.48	
Avail Cap(c_a), veh/h				645	0		981	3516	0	0	1783	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				22.8	0.0	0.0	23.2	9.0	0.0	0.0	20.2	0.0
Incr Delay (d2), s/veh				10.1	0.0	0.0	3.0	0.1	0.0	0.0	0.5	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.0	0.0	0.0	6.6	3.3	0.0	0.0	3.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				32.9	0.0	0.0	26.2	9.2	0.0	0.0	20.6	0.0
LnGrp LOS				C	A		C	A	A	A	C	
Approach Vol, veh/h					500	A		1274			536	A
Approach Delay, s/veh					32.9			14.9			20.6	
Approach LOS					C			B			C	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	18.3	26.5				44.8		27.6				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	9.0	10.8				11.7		20.8				
Green Ext Time (p_c), s	2.7	3.7				4.7		0.7				

Intersection Summary

HCM 6th Ctrl Delay	20.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	0	370	0	0	0	0	510	160	190	680	0
Future Volume (vph)	560	0	370	0	0	0	0	510	160	190	680	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1752	1568	0	0	0	0	3438	1538	1752	3505	0
Flt Permitted		0.950								0.389		
Satd. Flow (perm)	0	1752	1568	0	0	0	0	3438	1538	718	3505	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310						125			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	5%	5%	5%	3%	3%	3%
Adj. Flow (vph)	602	0	398	0	0	0	0	548	172	204	731	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	602	398	0	0	0	0	548	172	204	731	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effct Green (s)		16.0	16.0					22.5	22.5	37.4	37.4	
Actuated g/C Ratio		0.26	0.26					0.37	0.37	0.61	0.61	
v/c Ratio		1.32	0.62					0.44	0.27	0.33	0.34	
Control Delay		183.6	10.3					16.1	6.2	8.7	6.5	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		183.6	10.3					16.1	6.2	8.7	6.5	
LOS		F	B					B	A	A	A	
Approach Delay		114.6						13.8			7.0	
Approach LOS		F						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 61.4

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 49.4

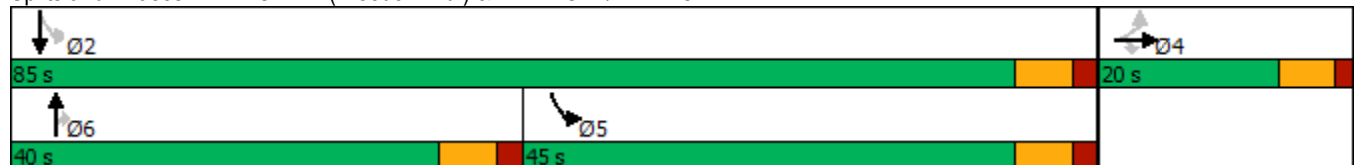
Intersection LOS: D

Intersection Capacity Utilization 69.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	560	0	370	0	0	0	0	510	160	190	680	0
Future Volume (veh/h)	560	0	370	0	0	0	0	510	160	190	680	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1826	1826	1856	1856	0
Adj Flow Rate, veh/h	602	0	0				0	548	0	204	731	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3				0	5	5	3	3	0
Cap, veh/h	464	0					0	1280		573	2138	0
Arrive On Green	0.26	0.00	0.00				0.00	0.37	0.00	0.17	0.61	0.00
Sat Flow, veh/h	1767	0	1572				0	3561	1547	1767	3618	0
Grp Volume(v), veh/h	602	0	0				0	548	0	204	731	0
Grp Sat Flow(s),veh/h/ln	1767	0	1572				0	1735	1547	1767	1763	0
Q Serve(g_s), s	16.0	0.0	0.0				0.0	7.2	0.0	0.0	6.3	0.0
Cycle Q Clear(g_c), s	16.0	0.0	0.0				0.0	7.2	0.0	0.0	6.3	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	464	0					0	1280		573	2138	0
V/C Ratio(X)	1.30	0.00					0.00	0.43		0.36	0.34	0.00
Avail Cap(c_a), veh/h	464	0					0	2047		1456	4681	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.5	0.0	0.0				0.0	14.4	0.0	16.9	6.0	0.0
Incr Delay (d2), s/veh	149.6	0.0	0.0				0.0	0.2	0.0	0.5	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	25.3	0.0	0.0				0.0	2.6	0.0	2.3	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	172.1	0.0	0.0				0.0	14.7	0.0	17.5	6.1	0.0
LnGrp LOS	F	A					A	B		B	A	A
Approach Vol, veh/h		602	A					548	A		935	
Approach Delay, s/veh		172.1						14.7			8.5	
Approach LOS		F						B			A	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		41.0		20.0	14.5	26.5						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		78.5		14.0	38.5	33.5						
Max Q Clear Time (g_c+I1), s		8.3		18.0	2.0	9.2						
Green Ext Time (p_c), s		3.9		0.0	1.3	2.6						
Intersection Summary												
HCM 6th Ctrl Delay			57.4									
HCM 6th LOS			E									
Notes												
Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	320	0	240	120	320	0	0	190	70
Future Volume (vph)	0	0	0	320	0	240	120	320	0	0	190	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.942							0.850
Flt Protected					0.972		0.950					
Satd. Flow (prot)	0	0	0	0	1673	0	1787	1881	0	0	1845	1568
Flt Permitted					0.972		0.950					
Satd. Flow (perm)	0	0	0	0	1673	0	1787	1881	0	0	1845	1568
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	1%	1%	1%	3%	3%	3%
Parking (#/hr)			0									
Adj. Flow (vph)	0	0	0	364	0	273	136	364	0	0	216	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	637	0	136	364	0	0	216	80
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	59.1%						ICU Level of Service B					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	160.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	320	0	240	120	320	0	0	190	70
Future Vol, veh/h	0	0	0	320	0	240	120	320	0	0	190	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	4	4	4	1	1	1	3	3	3
Mvmt Flow	0	0	0	364	0	273	136	364	0	0	216	80
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				892	932	364	296	0	-	-	-	0
Stage 1				636	636	-	-	-	-	-	-	-
Stage 2				256	296	-	-	-	-	-	-	-
Critical Hdwy				6.44	6.54	6.24	4.11	-	-	-	-	-
Critical Hdwy Stg 1				5.44	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.44	5.54	-	-	-	-	-	-	-
Follow-up Hdwy				3.536	4.036	3.336	2.209	-	-	-	-	-
Pot Cap-1 Maneuver				~ 310	264	676	1271	-	0	0	-	-
Stage 1				524	469	-	-	-	0	0	-	-
Stage 2				782	665	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				~ 277	0	676	1271	-	-	-	-	-
Mov Cap-2 Maneuver				~ 277	0	-	-	-	-	-	-	-
Stage 1				468	0	-	-	-	-	-	-	-
Stage 2				782	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				\$ 358.4		2.2		0				
HCM LOS				F								
Minor Lane/Major Mvmt		NBL	NBTWBLn1	SBT	SBR							
Capacity (veh/h)		1271	- 371	-	-							
HCM Lane V/C Ratio		0.107	- 1.715	-	-							
HCM Control Delay (s)		8.2	-\$ 358.4	-	-							
HCM Lane LOS		A	- F	-	-							
HCM 95th %tile Q(veh)		0.4	- 39.2	-	-							
Notes												
~: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined		*: All major volume in platoon						

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	0	90	0	0	0	0	300	200	110	400	0
Future Volume (vph)	140	0	90	0	0	0	0	300	200	110	400	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.947							0.850			
Flt Protected		0.970								0.950		
Satd. Flow (prot)	0	1728	0	0	0	0	0	1845	1568	1787	1881	0
Flt Permitted		0.970								0.950		
Satd. Flow (perm)	0	1728	0	0	0	0	0	1845	1568	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	3%	3%	3%	1%	1%	1%
Adj. Flow (vph)	163	0	105	0	0	0	0	349	233	128	465	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	268	0	0	0	0	0	349	233	128	465	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	59.1%						ICU Level of Service B					
Analysis Period (min)	15											

Intersection

Int Delay, s/veh 23

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↑	↗	↘	↑	
Traffic Vol, veh/h	140	0	90	0	0	0	0	300	200	110	400	0
Future Vol, veh/h	140	0	90	0	0	0	0	300	200	110	400	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	4	4	4	3	3	3	1	1	1
Mvmt Flow	163	0	105	0	0	0	0	349	233	128	465	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1187	1303	465	-	0	0	582	0	0
Stage 1	721	721	-	-	-	-	-	-	-
Stage 2	466	582	-	-	-	-	-	-	-
Critical Hdwy	6.41	6.51	6.21	-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.41	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.41	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	-	-	-	2.209	-	-
Pot Cap-1 Maneuver	209	161	599	0	-	-	997	-	0
Stage 1	483	433	-	0	-	-	-	-	0
Stage 2	634	501	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	182	0	599	-	-	-	997	-	-
Mov Cap-2 Maneuver	182	0	-	-	-	-	-	-	-
Stage 1	421	0	-	-	-	-	-	-	-
Stage 2	634	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	119.8	0	2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	250	997	-
HCM Lane V/C Ratio	-	-	1.07	0.128	-
HCM Control Delay (s)	-	-	119.8	9.1	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	11.2	0.4	-

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	240	90	200	200	0	0	0	0	150	0	300
Future Volume (vph)	0	240	90	200	200	0	0	0	0	150	0	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	282	106	235	235	0	0	0	0	176	0	353
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	282	106	235	235	0	0	0	0	0	176	353
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

Intersection												
Int Delay, s/veh	15											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Vol, veh/h	0	240	90	200	200	0	0	0	0	150	0	300
Future Vol, veh/h	0	240	90	200	200	0	0	0	0	150	0	300
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	282	106	235	235	0	0	0	0	176	0	353
Major/Minor	Major1		Major2				Minor2					
Conflicting Flow All	-	0	0	388	0	0				1040	1093	235
Stage 1	-	-	-	-	-	-				705	705	-
Stage 2	-	-	-	-	-	-				335	388	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1176	-	0				255	214	804
Stage 1	0	-	-	-	-	0				490	439	-
Stage 2	0	-	-	-	-	0				725	609	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	-	-	-	1176	-	-				204	0	804
Mov Cap-2 Maneuver	-	-	-	-	-	-				204	0	-
Stage 1	-	-	-	-	-	-				392	0	-
Stage 2	-	-	-	-	-	-				725	0	-
Approach	EB		WB				SB					
HCM Control Delay, s	0		4.4				35.5					
HCM LOS	E											
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1176	-	204	804						
HCM Lane V/C Ratio	-	-	0.2	-	0.865	0.439						
HCM Control Delay (s)	-	-	8.8	-	80.6	12.9						
HCM Lane LOS	-	-	A	-	F	B						
HCM 95th %tile Q(veh)	-	-	0.7	-	6.6	2.3						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	230	0	0	330	240	70	0	200	0	0	0
Future Volume (vph)	160	230	0	0	330	240	70	0	200	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	182	261	0	0	375	273	80	0	227	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	182	261	0	0	375	273	0	80	227	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	5.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	160	230	0	0	330	240	70	0	200	0	0	0
Future Vol, veh/h	160	230	0	0	330	240	70	0	200	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	182	261	0	0	375	273	80	0	227	0	0	0

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	648	0	-	-	-	0	1137 1273 261
Stage 1	-	-	-	-	-	-	625 625 -
Stage 2	-	-	-	-	-	-	512 648 -
Critical Hdwy	4.11	-	-	-	-	-	6.45 6.55 6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45 5.55 -
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45 5.55 -
Follow-up Hdwy	2.209	-	-	-	-	-	3.545 4.045 3.345
Pot Cap-1 Maneuver	943	-	0	0	-	-	220 165 770
Stage 1	-	-	0	0	-	-	528 473 -
Stage 2	-	-	0	0	-	-	596 461 -
Platoon blocked, %	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	943	-	-	-	-	-	178 0 770
Mov Cap-2 Maneuver	-	-	-	-	-	-	178 0 -
Stage 1	-	-	-	-	-	-	426 0 -
Stage 2	-	-	-	-	-	-	596 0 -

Approach	EB	WB	NB
HCM Control Delay, s	4	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR
Capacity (veh/h)	178	770	943	-	-	-
HCM Lane V/C Ratio	0.447	0.295	0.193	-	-	-
HCM Control Delay (s)	40.6	11.6	9.7	-	-	-
HCM Lane LOS	E	B	A	-	-	-
HCM 95th %tile Q(veh)	2.1	1.2	0.7	-	-	-

APPENDIX O8

Year 2048 No Build HCS7 (Roundabouts) AM & PM Peak Hour

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	70	0	300					0		610	160	0	60	340	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	81	0	349					0		696	183	0	68	384	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		81.00	349.00				417.60	278.40	183.00	40.68	411.32	
Entry Volume veh/h		75.70	326.17				397.71	265.14	174.29	39.12	395.50	
Circulating Flow (v_c), pc/h	452			777			149			0		
Exiting Flow (v_{ex}), pc/h	68			0			777			384		
Capacity (C_{PCE}), pc/h		927.62	953.75				1145.02	1145.02	1219.48	1285.71	1285.71	
Capacity (c), veh/h		866.94	891.36				1090.50	1090.50	1161.41	1236.26	1236.26	
v/c Ratio (x)		0.09	0.37				0.36	0.24	0.15	0.03	0.32	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.0	8.2				7.0	5.6	4.4	3.2	5.9	
Lane LOS		A	A				A	A	A	A	A	
95% Queue, veh		0.3	1.7				1.7	1.0	0.5	0.1	1.4	
Approach Delay, s/veh	7.6						6.0			5.6		
Approach LOS	A						A			A		
Intersection Delay, s/veh LOS	6.3						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT			L		T				T
Volume (V), veh/h					0	90	0	120	0	280	400		0		310	220
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (V_{PC}), pc/h					0	98	0	130	0	304	434		0		343	244
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					98.00	130.00	304.00	434.00			343.00	244.00
Entry Volume veh/h					97.03	128.71	300.99	429.70			333.01	236.89
Circulating Flow (v_c), pc/h	441			738			0			402		
Exiting Flow (v_{ex}), pc/h	0			304			434			441		
Capacity (C_{pc}), pc/h					754.51	917.37	1285.71	1285.71			940.49	1014.98
Capacity (c), veh/h					747.04	908.29	1272.98	1272.98			913.10	985.42
v/c Ratio (x)					0.13	0.14	0.24	0.34			0.36	0.24

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					6.2	5.3	4.9	5.9			8.0	6.0
Lane LOS					A	A	A	A			A	A
95% Queue, veh					0.4	0.5	0.9	1.5			1.7	0.9
Approach Delay, s/veh				5.7			5.5			7.2		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	6.2						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.86
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR								TR				LT			
Volume (V), veh/h	0	240	0	150					0		390	430	0	120	230	
Percent Heavy Vehicles, %	0	1	0	1					0		3	3	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	282	0	176					0		467	515	0	145	278	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000						4.2000			4.2000	
Follow-Up Headway (s)		2.8000						2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		458.00						982.00			423.00	
Entry Volume veh/h		453.47						953.40			406.73	
Circulating Flow (v_c), pc/h	423			749			427			0		
Exiting Flow (v_{ex}), pc/h	660			0			749			454		
Capacity (C_{PCE}), pc/h		925.26						922.38			1285.71	
Capacity (c), veh/h		916.09						895.52			1236.26	
v/c Ratio (x)		0.49						1.06			0.33	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		10.2						69.8			6.0	
Lane LOS		B						F			A	
95% Queue, veh		2.8						22.9			1.5	
Approach Delay, s/veh	10.2						69.8			6.0		
Approach LOS	B						F			A		
Intersection Delay, s/veh LOS	40.6						E					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.88
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LTR				LT				TR	
Volume (V), veh/h					0	140	0	110	0	220	410		0		210	350
Percent Heavy Vehicles, %					0	9	0	9	0	1	1		0		17	17
Flow Rate (v_{pce}), pc/h					0	173	0	136	0	252	471		0		279	465
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000			4.2000			4.2000	
Follow-Up Headway (s)					2.8000			2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					309.00			723.00			744.00	
Entry Volume veh/h					283.49			715.84			635.90	
Circulating Flow (v_c), pc/h	452			723			0			425		
Exiting Flow (v_{ex}), pc/h	0			717			607			452		
Capacity (c_{pce}), pc/h					732.70			1285.71			923.82	
Capacity (c), veh/h					672.20			1272.98			789.59	
v/c Ratio (x)					0.42			0.56			0.81	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					11.3			9.2			24.5	
Lane LOS					B			A			C	
95% Queue, veh					2.1			3.7			8.6	
Approach Delay, s/veh				11.3			9.2			24.5		
Approach LOS				B			A			C		
Intersection Delay, s/veh LOS	15.5						C					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	140	0	410					0		710	140	0	70	440	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	163	0	477					0		810	160	0	79	497	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		163.00	477.00				607.50	202.50	160.00	40.32	535.68	
Entry Volume veh/h		152.34	445.79				578.57	192.86	152.38	38.77	515.08	
Circulating Flow (v_c), pc/h	576			973			242			0		
Exiting Flow (v_{ex}), pc/h	79			0			973			497		
Capacity (C_{PCE}), pc/h		848.16	873.51				1065.13	1065.13	1209.09	1285.71	1285.71	
Capacity (c), veh/h		792.67	816.36				1014.40	1014.40	1151.52	1236.26	1236.26	
v/c Ratio (x)		0.19	0.55				0.57	0.19	0.13	0.03	0.42	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.6	12.3				11.0	5.3	4.3	3.2	7.1	
Lane LOS		A	B				B	A	A	A	A	
95% Queue, veh		0.7	3.4				3.7	0.7	0.5	0.1	2.1	
Approach Delay, s/veh	10.9						8.7			6.8		
Approach LOS	B						A			A		
Intersection Delay, s/veh LOS	8.8						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT			L	T				T	
Volume (V), veh/h					0	230	0	100	0	460	390		0		280	140
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (V_{PC}), pc/h					0	250	0	109	0	500	424		0		310	155
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					250.00	109.00	500.00	424.00			310.00	155.00
Entry Volume veh/h					247.52	107.92	495.05	419.80			300.97	150.49
Circulating Flow (v_c), pc/h	560			924			0			750		
Exiting Flow (v_{ex}), pc/h	0			500			424			560		
Capacity (C_{pc}), pc/h					659.67	924.54	1285.71	1285.71			717.47	871.47
Capacity (c), veh/h					653.14	915.38	1272.98	1272.98			696.58	846.09
v/c Ratio (x)					0.38	0.12	0.39	0.33			0.43	0.18

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					10.7	5.0	6.6	5.9			11.2	6.1
Lane LOS					B	A	A	A			B	A
95% Queue, veh					1.8	0.4	1.9	1.5			2.2	0.6
Approach Delay, s/veh				9.0			6.2			9.5		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	7.7						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR								TR				LT			
Volume (V), veh/h	0	280	0	390					0		290	270	0	120	620	
Percent Heavy Vehicles, %	0	1	0	1					0		2	2	0	3	3	
Flow Rate (V_{PCE}), pc/h	0	314	0	438					0		329	306	0	137	710	
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000						4.2000			4.2000	
Follow-Up Headway (s)		2.8000						2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		752.00						635.00			847.00	
Entry Volume veh/h		744.55						622.55			822.33	
Circulating Flow (v_c), pc/h	847			643			451			0		
Exiting Flow (v_{ex}), pc/h	443			0			643			1148		
Capacity (C_{PCE}), pc/h		665.34						905.32			1285.71	
Capacity (c), veh/h		658.75						887.57			1248.27	
v/c Ratio (x)		1.13						0.70			0.66	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		100.1						16.5			11.6	
Lane LOS		F						C			B	
95% Queue, veh		22.9						6.0			5.3	
Approach Delay, s/veh	100.1						16.5			11.6		
Approach LOS	F						C			B		
Intersection Delay, s/veh LOS	43.1						E					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM No Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.78
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment																
Volume (V), veh/h					0	380	0	190	0	110	460		0		360	350
Percent Heavy Vehicles, %					0	4	0	4	0	1	1		0		7	7
Flow Rate (v_{pce}), pc/h					0	507	0	253	0	142	596		0		494	480
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000			4.2000			4.2000	
Follow-Up Headway (s)					2.8000			2.8000			2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					760.00			738.00			974.00	
Entry Volume veh/h					730.77			730.69			910.28	
Circulating Flow (v_c), pc/h	1001			738			0			649		
Exiting Flow (v_{ex}), pc/h	0			622			849			1001		
Capacity (c_{pce}), pc/h					724.20			1285.71			776.11	
Capacity (c), veh/h					696.35			1272.98			725.33	
v/c Ratio (x)					1.05			0.57			1.25	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					71.9			9.4			145.4	
Lane LOS					F			A			F	
95% Queue, veh					18.8			3.8			33.4	
Approach Delay, s/veh				71.9			9.4			145.4		
Approach LOS				F			A			F		
Intersection Delay, s/veh LOS	80.9						F					

APPENDIX O9

Year 2048 No Build with Retimings Synchro AM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	670	230	160	540	0	0	0	0	140	0	550
Future Volume (vph)	0	670	230	160	540	0	0	0	0	140	0	550
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1792	1524	1719	1810	0	0	0	0	0	1656	1482
Flt Permitted				0.108							0.950	
Satd. Flow (perm)	0	1792	1524	195	1810	0	0	0	0	0	1656	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			203									178
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	1%	1%	1%	9%	9%	9%
Adj. Flow (vph)	0	859	295	205	692	0	0	0	0	179	0	705
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	859	295	205	692	0	0	0	0	0	179	705
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		37.0	37.0	17.0	54.0					46.0	46.0	46.0
Total Split (%)		37.0%	37.0%	17.0%	54.0%					46.0%	46.0%	46.0%
Maximum Green (s)		30.5	30.5	10.5	47.5					40.0	40.0	40.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		33.0	33.0	49.4	49.4						41.5	41.5
Actuated g/C Ratio		0.33	0.33	0.50	0.50						0.42	0.42
v/c Ratio		1.44	0.46	0.71	0.77						0.26	0.97
Control Delay		234.7	11.1	48.0	27.1						20.1	50.0
Queue Delay		0.0	0.0	0.0	20.8						0.0	0.0
Total Delay		234.7	11.1	48.0	47.9						20.1	50.0
LOS		F	B	D	D						C	D
Approach Delay		177.5			47.9						44.0	
Approach LOS		F			D						D	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 98.9

Natural Cycle: 110

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.44

Intersection Signal Delay: 97.7

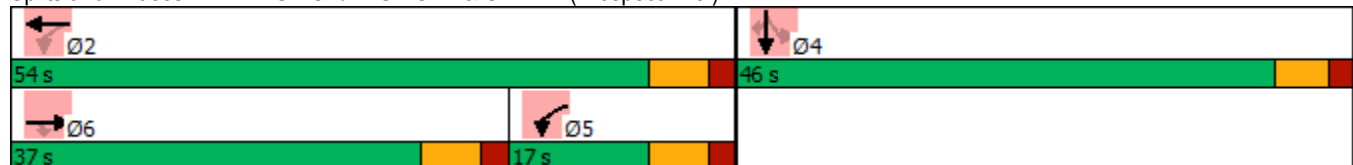
Intersection LOS: F

Intersection Capacity Utilization 72.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

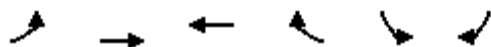
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	670	230	160	540	0	0	0	0	140	0	550
Future Volume (veh/h)	0	670	230	160	540	0	0	0	0	140	0	550
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1811	1811	1826	1826	0				1767	1767	1767
Adj Flow Rate, veh/h	0	859	295	205	692	0				179	0	705
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	6	6	5	5	0				9	9	9
Cap, veh/h	0	607	514	276	899	0				717	0	638
Arrive On Green	0.00	0.33	0.33	0.12	0.49	0.00				0.43	0.00	0.43
Sat Flow, veh/h	0	1811	1535	1739	1826	0				1682	0	1497
Grp Volume(v), veh/h	0	859	295	205	692	0				179	0	705
Grp Sat Flow(s),veh/h/ln	0	1811	1535	1739	1826	0				1682	0	1497
Q Serve(g_s), s	0.0	33.0	15.6	6.9	30.5	0.0				6.7	0.0	42.0
Cycle Q Clear(g_c), s	0.0	33.0	15.6	6.9	30.5	0.0				6.7	0.0	42.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	607	514	276	899	0				717	0	638
V/C Ratio(X)	0.00	1.42	0.57	0.74	0.77	0.00				0.25	0.00	1.10
Avail Cap(c_a), veh/h	0	607	514	303	927	0				717	0	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	32.8	27.0	40.2	20.4	0.0				18.1	0.0	28.3
Incr Delay (d2), s/veh	0.0	196.8	1.9	8.6	4.2	0.0				0.2	0.0	67.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	47.1	5.9	5.1	13.3	0.0				2.6	0.0	12.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	229.5	28.9	48.9	24.6	0.0				18.3	0.0	96.0
LnGrp LOS	A	F	C	D	C	A				B	A	F
Approach Vol, veh/h		1154			897						884	
Approach Delay, s/veh		178.3			30.1						80.3	
Approach LOS		F			C						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		52.5		46.0	15.5	37.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		47.5		40.0	10.5	30.5						
Max Q Clear Time (g_c+I1), s		32.5		44.0	8.9	35.0						
Green Ext Time (p_c), s		4.4		0.0	0.1	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			103.5									
HCM 6th LOS			F									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	520	290	700	90	0	0
Future Volume (vph)	520	290	700	90	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1736	1827	1863	1583	0	0
Flt Permitted	0.132					
Satd. Flow (perm)	241	1827	1863	1583	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				110		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Adj. Flow (vph)	634	354	854	110	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	634	354	854	110	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0	20.0		
Minimum Split (s)	20.5	26.5	26.5	26.5		

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings 2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	53.1	57.2	26.4	26.4		
Actuated g/C Ratio	0.93	1.00	0.46	0.46		
v/c Ratio	0.78	0.19	0.99	0.14		
Control Delay	17.0	0.2	50.4	3.7		
Queue Delay	0.1	0.0	0.0	0.0		
Total Delay	17.2	0.2	50.4	3.7		
LOS	B	A	D	A		
Approach Delay		11.1	45.1			
Approach LOS		B	D			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 57.2

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 27.9

Intersection LOS: C

Intersection Capacity Utilization 72.3%

ICU Level of Service C

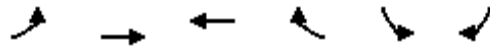
Analysis Period (min) 15

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary 2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	520	290	700	90	0	0
Future Volume (veh/h)	520	290	700	90	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1841	1841	1870	1870		
Adj Flow Rate, veh/h	634	354	854	110		
Peak Hour Factor	0.82	0.82	0.82	0.82		
Percent Heavy Veh, %	4	4	2	2		
Cap, veh/h	785	1705	898	761		
Arrive On Green	0.37	0.93	0.48	0.48		
Sat Flow, veh/h	1753	1841	1870	1585		
Grp Volume(v), veh/h	634	354	854	110		
Grp Sat Flow(s),veh/h/ln	1753	1841	1870	1585		
Q Serve(g_s), s	12.8	1.0	23.7	2.1		
Cycle Q Clear(g_c), s	12.8	1.0	23.7	2.1		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	785	1705	898	761		
V/C Ratio(X)	0.81	0.21	0.95	0.14		
Avail Cap(c_a), veh/h	1234	3263	898	761		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	13.4	0.2	13.5	7.9		
Incr Delay (d2), s/veh	2.2	0.1	19.3	0.1		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	4.7	0.0	12.6	0.6		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	15.6	0.3	32.8	8.0		
LnGrp LOS	B	A	C	A		
Approach Vol, veh/h		988	964			
Approach Delay, s/veh		10.1	30.0			
Approach LOS		B	C			
Timer - Assigned Phs	1	2		6		
Phs Duration (G+Y+Rc), s	24.2	30.0		54.2		
Change Period (Y+Rc), s	6.5	6.5		6.5		
Max Green Setting (Gmax), s	31.5	23.5		93.5		
Max Q Clear Time (g_c+I1), s	14.8	25.7		3.0		
Green Ext Time (p_c), s	2.8	0.0		2.5		
Intersection Summary						
HCM 6th Ctrl Delay			19.9			
HCM 6th LOS			B			

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	290	0	0	570	220	460
Future Volume (vph)	290	0	0	570	220	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1845	0	0	1881	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1845	0	0	1881	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						487
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	1%	1%	2%	2%
Adj. Flow (vph)	345	0	0	679	262	548
Shared Lane Traffic (%)						
Lane Group Flow (vph)	345	0	0	679	262	548
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Walk Time (s)	5.0			5.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		
Act Effect Green (s)	31.3			31.3	18.7	18.7
Actuated g/C Ratio	0.54			0.54	0.32	0.32
v/c Ratio	0.35			0.67	0.46	0.66
Control Delay	9.5			14.5	20.5	7.6
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.5			14.5	20.5	7.6
LOS	A			B	C	A
Approach Delay	9.5			14.5	11.8	
Approach LOS	A			B	B	

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 58.5
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.67
 Intersection Signal Delay: 12.4
 Intersection Capacity Utilization 51.8%
 Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)

← Ø2	↖ Ø4
59 s	41 s
→ Ø6	
59 s	

HCM 6th Signalized Intersection Summary 3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	290	0	0	570	220	460
Future Volume (veh/h)	290	0	0	570	220	460
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1885	1870	1870
Adj Flow Rate, veh/h	345	0	0	679	262	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	0	0	1	2	2
Cap, veh/h	983	0	0	999	494	
Arrive On Green	0.53	0.00	0.00	0.53	0.28	0.00
Sat Flow, veh/h	1856	0	0	1885	1781	1585
Grp Volume(v), veh/h	345	0	0	679	262	0
Grp Sat Flow(s),veh/h/ln	1856	0	0	1885	1781	1585
Q Serve(g_s), s	4.5	0.0	0.0	11.0	5.2	0.0
Cycle Q Clear(g_c), s	4.5	0.0	0.0	11.0	5.2	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	983	0	0	999	494	
V/C Ratio(X)	0.35	0.00	0.00	0.68	0.53	
Avail Cap(c_a), veh/h	2458	0	0	2498	1588	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.6	0.0	0.0	7.2	12.7	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	1.2	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	3.0	1.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.9	0.0	0.0	8.3	13.6	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	345			679	262	A
Approach Delay, s/veh	5.9			8.3	13.6	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	26.0		15.5		26.0	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	13.0		7.2		6.5	
Green Ext Time (p_c), s	5.7		1.1		2.4	
Intersection Summary						
HCM 6th Ctrl Delay			8.8			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	620	170	300	710	0	0	0	0	240	0	440
Future Volume (vph)	0	620	170	300	710	0	0	0	0	240	0	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0			450		450
Storage Lanes	0		1	1		0	0			1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			198									439
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	721	198	349	826	0	0	0	0	279	0	512
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	721	198	349	826	0	0	0	0	0	279	512
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	5.0	5.0					7.0	7.0	7.0
Minimum Split (s)		9.0	9.0	10.0	11.0					13.0	13.0	13.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.44	0.31	0.53	0.32					0.87	0.58	0.58
Control Delay		28.0	5.0	42.1	4.3					67.5	9.2	9.2
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		28.0	5.0	42.1	4.3					67.5	9.2	9.2
LOS		C	A	D	A					E	A	A
Approach Delay		23.1			15.5					29.8		
Approach LOS		C			B					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 21.8

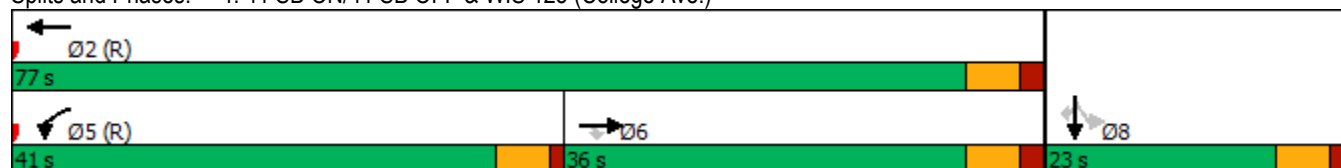
Intersection LOS: C

Intersection Capacity Utilization 45.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↗	↑↑					↗	↖	↗↖
Traffic Volume (veh/h)	0	620	170	300	710	0	0	0	0	240	0	440
Future Volume (veh/h)	0	620	170	300	710	0	0	0	0	240	0	440
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	721	0	349	826	0				279	0	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86				0.86	0.86	0.86
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	2347		410	2594	0				677	0	
Arrive On Green	0.00	0.15	0.00	0.23	0.73	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1781	3647	0				3563	0	3170
Grp Volume(v), veh/h	0	721	0	349	826	0				279	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	12.6	0.0	18.8	8.2	0.0				6.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	12.6	0.0	18.8	8.2	0.0				6.9	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2347		410	2594	0				677	0	
V/C Ratio(X)	0.00	0.31		0.85	0.32	0.00				0.41	0.00	
Avail Cap(c_a), veh/h	0	2347		659	2594	0				677	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.77	0.77	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	28.2	0.0	36.8	4.7	0.0				35.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	4.7	0.2	0.0				1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.8	0.0	8.6	2.6	0.0				3.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	28.6	0.0	41.6	5.0	0.0				37.4	0.0	0.0
LnGrp LOS	A	C		D	A	A				D	A	
Approach Vol, veh/h		721	A		1175						279	A
Approach Delay, s/veh		28.6			15.9						37.4	
Approach LOS		C			B						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		77.0			27.0	50.0		23.0				
Change Period (Y+Rc), s		6.0			5.0	6.0		6.0				
Max Green Setting (Gmax), s		71.0			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		10.2			20.8	14.6		8.9				
Green Ext Time (p_c), s		4.6			1.3	3.2		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			22.8									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	630	0	0	710	130	300	0	440	0	0	0
Future Volume (vph)	230	630	0	0	710	130	300	0	440	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.208						0.950					
Satd. Flow (perm)	391	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						151			472			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	267	733	0	0	826	151	349	0	512	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	267	733	0	0	826	151	349	0	512	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	72.0			37.0	37.0	28.0	28.0	28.0			
Total Split (%)	35.0%	72.0%			37.0%	37.0%	28.0%	28.0%	28.0%			
Maximum Green (s)	29.0	66.0			31.0	31.0	23.0	23.0	23.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	68.0	68.0			33.0	33.0	24.0		24.0			
Actuated g/C Ratio	0.68	0.68			0.33	0.33	0.24		0.24			
v/c Ratio	0.38	0.30			0.49	0.24	0.87		0.50			
Control Delay	25.5	7.2			28.0	5.1	59.1		6.2			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	25.5	7.2			28.0	5.1	59.1		6.2			
LOS	C	A			C	A	E		A			
Approach Delay		12.1			24.5			27.6				
Approach LOS		B			C			C				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 21.1

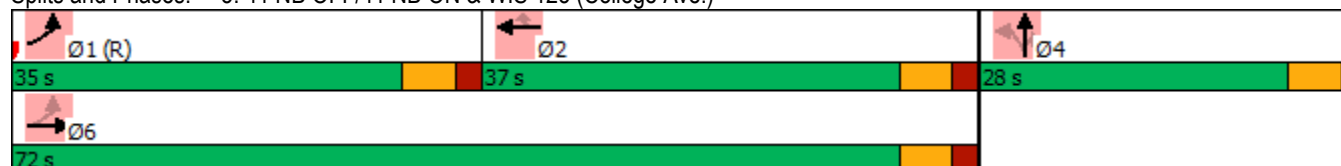
Intersection LOS: C

Intersection Capacity Utilization 45.2%

ICU Level of Service A

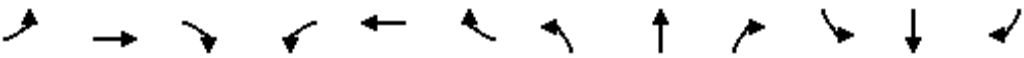
Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	230	630	0	0	710	130	300	0	440	0	0	0
Future Volume (veh/h)	230	630	0	0	710	130	300	0	440	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	267	733	0	0	826	0	349	0	0			
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	529	2436	0	0	2708		855	0				
Arrive On Green	0.11	0.68	0.00	0.00	0.18	0.00	0.24	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	267	733	0	0	826	0	349	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	5.9	8.2	0.0	0.0	14.1	0.0	8.3	0.0	0.0			
Cycle Q Clear(g_c), s	5.9	8.2	0.0	0.0	14.1	0.0	8.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	529	2436	0	0	2708		855	0				
V/C Ratio(X)	0.50	0.30	0.00	0.00	0.30		0.41	0.00				
Avail Cap(c_a), veh/h	889	2436	0	0	2708		855	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.90	0.90	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	8.9	6.4	0.0	0.0	25.2	0.0	32.0	0.0	0.0			
Incr Delay (d2), s/veh	0.7	0.3	0.0	0.0	0.3	0.0	1.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.1	2.9	0.0	0.0	6.5	0.0	3.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.6	6.7	0.0	0.0	25.5	0.0	33.5	0.0	0.0			
LnGrp LOS	A	A	A	A	C		C	A				
Approach Vol, veh/h	1000			826			A	349			A	
Approach Delay, s/veh	7.5			25.5				33.5				
Approach LOS	A			C				C				
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	15.0	57.0		28.0		72.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	31.0		23.0		66.0						
Max Q Clear Time (g_c+I1), s	7.9	16.1		10.3		10.2						
Green Ext Time (p_c), s	1.0	3.7		1.3		3.9						

Intersection Summary

HCM 6th Ctrl Delay 18.5

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	720	280	410	720	0	0	0	0	160	0	360
Future Volume (vph)	0	720	280	410	720	0	0	0	0	160	0	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1770	1583
Flt Permitted				0.138							0.950	
Satd. Flow (perm)	0	5085	1583	257	3539	0	0	0	0	0	1770	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			359									169
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	923	359	526	923	0	0	0	0	205	0	462
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	923	359	526	923	0	0	0	0	0	205	462
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

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Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		31.0	31.0	38.0	69.0					31.0	31.0	31.0
Total Split (%)		31.0%	31.0%	38.0%	69.0%					31.0%	31.0%	31.0%
Maximum Green (s)		25.0	25.0	34.0	63.0					25.0	25.0	25.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		27.0	27.0	67.4	67.4						24.6	24.6
Actuated g/C Ratio		0.27	0.27	0.67	0.67						0.25	0.25
v/c Ratio		0.67	0.52	0.73	0.39						0.47	0.89
Control Delay		35.4	6.2	16.5	1.6						35.4	43.8
Queue Delay		0.1	0.0	4.6	1.0						0.0	0.0
Total Delay		35.6	6.2	21.1	2.6						35.4	43.8
LOS		D	A	C	A						D	D
Approach Delay		27.4			9.3						41.2	
Approach LOS		C			A						D	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 22.4

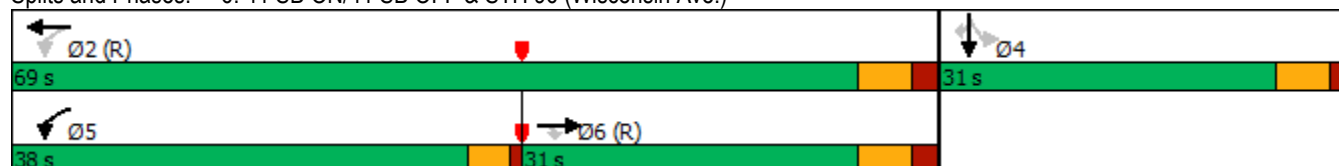
Intersection LOS: C

Intersection Capacity Utilization 58.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑						↖	↗
Traffic Volume (veh/h)	0	720	280	410	720	0	0	0	0	160	0	360
Future Volume (veh/h)	0	720	280	410	720	0	0	0	0	160	0	360
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	923	0	526	923	0				205	0	462
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1379		732	2310	0				481	0	428
Arrive On Green	0.00	0.27	0.00	0.68	1.00	0.00				0.27	0.00	0.27
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1781	0	1585
Grp Volume(v), veh/h	0	923	0	526	923	0				205	0	462
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	16.1	0.0	13.6	0.0	0.0				9.5	0.0	27.0
Cycle Q Clear(g_c), s	0.0	16.1	0.0	13.6	0.0	0.0				9.5	0.0	27.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1379		732	2310	0				481	0	428
V/C Ratio(X)	0.00	0.67		0.72	0.40	0.00				0.43	0.00	1.08
Avail Cap(c_a), veh/h	0	1379		732	2310	0				481	0	428
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.50	0.50	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	32.5	0.0	6.3	0.0	0.0				30.1	0.0	36.5
Incr Delay (d2), s/veh	0.0	2.6	0.0	3.1	0.3	0.0				0.6	0.0	66.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.9	0.0	3.0	0.1	0.0				4.1	0.0	28.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	35.1	0.0	9.4	0.3	0.0				30.7	0.0	103.0
LnGrp LOS	A	D		A	A	A				C	A	F
Approach Vol, veh/h		923	A		1449						667	
Approach Delay, s/veh		35.1			3.6						80.8	
Approach LOS		D			A						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		69.0		31.0	38.0	31.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		63.0		25.0	34.0	25.0						
Max Q Clear Time (g_c+I1), s		2.0		29.0	15.6	18.1						
Green Ext Time (p_c), s		8.6		0.0	1.3	3.5						
Intersection Summary												
HCM 6th Ctrl Delay			30.1									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	690	0	0	780	80	350	0	390	0	0	0
Future Volume (vph)	190	690	0	0	780	80	350	0	390	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.133						0.950					
Satd. Flow (perm)	248	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						99			223			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	235	852	0	0	963	99	432	0	481	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	235	852	0	0	963	99	432	0	481	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	0.33	0.34			0.63	0.18	1.17		0.92			
Control Delay	1.5	3.2			32.5	6.3	138.4		45.6			
Queue Delay	0.8	1.3			0.3	0.0	0.0		0.0			
Total Delay	2.3	4.4			32.8	6.3	138.4		45.6			
LOS	A	A			C	A	F		D			
Approach Delay		4.0			30.3			89.6				
Approach LOS		A			C			F				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 38.6

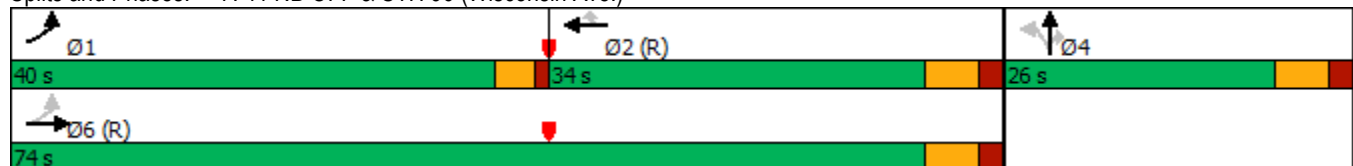
Intersection LOS: D

Intersection Capacity Utilization 58.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	190	690	0	0	780	80	350	0	390	0	0	0
Future Volume (veh/h)	190	690	0	0	780	80	350	0	390	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	235	852	0	0	963	99	432	0	0			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	811	2678	0	0	1806	561	593	0				
Arrive On Green	0.12	0.25	0.00	0.00	0.35	0.35	0.17	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	235	852	0	0	963	99	432	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	5.4	19.6	0.0	0.0	15.0	4.3	11.5	0.0	0.0			
Cycle Q Clear(g_c), s	5.4	19.6	0.0	0.0	15.0	4.3	11.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	811	2678	0	0	1806	561	593	0				
V/C Ratio(X)	0.29	0.32	0.00	0.00	0.53	0.18	0.73	0.00				
Avail Cap(c_a), veh/h	811	2678	0	0	1806	561	784	0				
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.69	0.69	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	11.5	16.6	0.0	0.0	25.7	22.3	39.5	0.0	0.0			
Incr Delay (d2), s/veh	0.6	0.2	0.0	0.0	1.1	0.7	2.4	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.1	9.3	0.0	0.0	6.2	1.7	5.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.1	16.8	0.0	0.0	26.9	23.0	41.9	0.0	0.0			
LnGrp LOS	B	B	A	A	C	C	D	A				
Approach Vol, veh/h	1087			1062			432			A		
Approach Delay, s/veh	15.8			26.5			41.9					
Approach LOS	B			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	39.4		20.6		79.4						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	7.4	17.0		13.5		21.6						
Green Ext Time (p_c), s	0.5	5.4		1.1		7.6						

Intersection Summary

HCM 6th Ctrl Delay	24.6
HCM 6th LOS	C

Notes

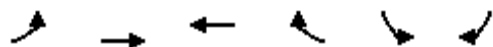
User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	280	1560	810	460	230	1090
Future Volume (vph)	280	1560	810	460	230	1090
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1763	3539	3505	1568	1770	1583
Flt Permitted	0.097				0.950	
Satd. Flow (perm)	180	3539	3505	1568	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				605		249
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	368	2053	1066	605	303	1434
Shared Lane Traffic (%)						
Lane Group Flow (vph)	368	2053	1066	605	303	1434
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0

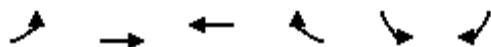
7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	16.0
Total Split (s)	15.0	45.0	45.0	45.0	40.0	40.0
Total Split (%)	15.0%	45.0%	45.0%	45.0%	40.0%	40.0%
Maximum Green (s)	10.0	39.0	39.0	39.0	34.0	34.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	Min	Min	Min	None	None
Act Effct Green (s)	53.1	53.1	38.1	38.1	36.0	36.0
Actuated g/C Ratio	0.55	0.55	0.39	0.39	0.37	0.37
v/c Ratio	1.33	1.06	0.78	0.62	0.46	1.93
Control Delay	195.3	62.0	30.3	4.7	26.8	443.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	195.3	62.0	30.3	4.7	26.8	443.4
LOS	F	E	C	A	C	F
Approach Delay		82.2	21.0		370.7	
Approach LOS		F	C		F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 97.2

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.93

Intersection Signal Delay: 150.7

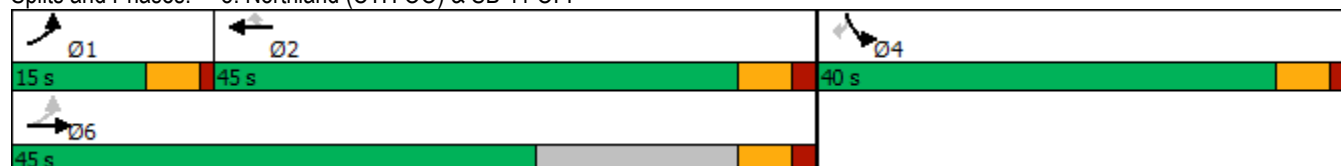
Intersection LOS: F

Intersection Capacity Utilization 96.5%

ICU Level of Service F

Analysis Period (min) 15

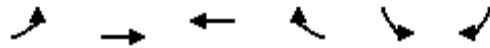
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	280	1560	810	460	230	1090
Future Volume (veh/h)	280	1560	810	460	230	1090
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	368	2053	1066	0	303	0
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	467	2242	1450		436	
Arrive On Green	0.16	0.63	0.41	0.00	0.24	0.00
Sat Flow, veh/h	1781	3647	3618	1572	1781	1585
Grp Volume(v), veh/h	368	2053	1066	0	303	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1763	1572	1781	1585
Q Serve(g_s), s	7.0	32.5	16.4	0.0	10.0	0.0
Cycle Q Clear(g_c), s	7.0	32.5	16.4	0.0	10.0	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	467	2242	1450		436	
V/C Ratio(X)	0.79	0.92	0.74		0.69	
Avail Cap(c_a), veh/h	491	2263	2245		996	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	12.0	10.4	16.0	0.0	22.1	0.0
Incr Delay (d2), s/veh	8.1	6.5	0.7	0.0	2.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	11.1	6.0	0.0	4.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.0	16.9	16.7	0.0	25.0	0.0
LnGrp LOS	C	B	B		C	
Approach Vol, veh/h		2421	1066	A	303	A
Approach Delay, s/veh		17.3	16.7		25.0	
Approach LOS		B	B		C	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	14.1	30.5		19.8		44.6
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	10.0	39.0		34.0		39.0
Max Q Clear Time (g_c+I1), s	9.0	18.4		12.0		34.5
Green Ext Time (p_c), s	0.2	5.6		1.9		4.1

Intersection Summary

HCM 6th Ctrl Delay	17.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	810	980	0	0	1000	170	270	0	490	0	0	0
Future Volume (vph)	810	980	0	0	1000	170	270	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	3574	0	0	3539	1583	0	1671	1495	0	0	0
Flt Permitted	0.105							0.950				
Satd. Flow (perm)	198	3574	0	0	3539	1583	0	1671	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						224			97			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	1066	1289	0	0	1316	224	355	0	645	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1066	1289	0	0	1316	224	0	355	645	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0	10.0			
Minimum Split (s)	12.0	26.0			36.0	36.0	20.0	20.0	20.0			

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	64.0			39.0	39.0	26.0	26.0	26.0			
Total Split (%)	27.8%	71.1%			43.3%	43.3%	28.9%	28.9%	28.9%			
Maximum Green (s)	20.0	58.0			33.0	33.0	20.0	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	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lead/Lag	Lead				Lag				Lag			
Lead-Lag Optimize?	Yes				Yes				Yes			
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0	4.0			
Recall Mode	None	Min			Min	Min	None	None	None			
Act Effct Green (s)	60.0	60.0			35.0	35.0		22.0	22.0			
Actuated g/C Ratio	0.67	0.67			0.39	0.39		0.24	0.24			
v/c Ratio	2.12	0.54			0.96	0.30		0.87	1.47			
Control Delay	532.6	8.9			43.7	3.8		55.9	250.1			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	532.6	8.9			43.7	3.8		55.9	250.1			
LOS	F	A			D	A		E	F			
Approach Delay	245.9				37.9				181.1			
Approach LOS	F				D				F			

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 130

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 2.12

Intersection Signal Delay: 167.2

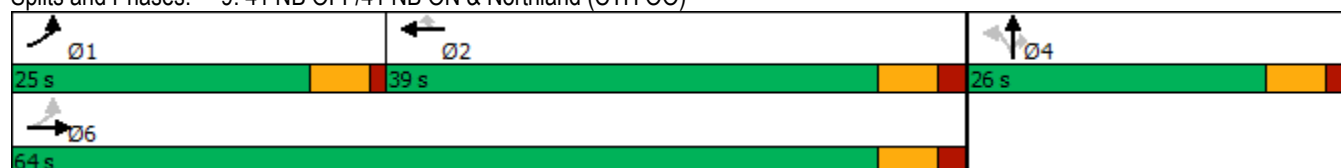
Intersection LOS: F

Intersection Capacity Utilization 97.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	810	980	0	0	1000	170	270	0	490	0	0	0
Future Volume (veh/h)	810	980	0	0	1000	170	270	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781			
Adj Flow Rate, veh/h	1066	1289	0	0	1316	0	355	0	0			
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76			
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8			
Cap, veh/h	507	2388	0	0	1382		415	0				
Arrive On Green	0.23	0.67	0.00	0.00	0.39	0.00	0.24	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3647	1585	1697	0	1510			
Grp Volume(v), veh/h	1066	1289	0	0	1316	0	355	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1777	1585	1697	0	1510			
Q Serve(g_s), s	21.0	16.9	0.0	0.0	32.3	0.0	18.0	0.0	0.0			
Cycle Q Clear(g_c), s	21.0	16.9	0.0	0.0	32.3	0.0	18.0	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	507	2388	0	0	1382		415	0				
V/C Ratio(X)	2.10	0.54	0.00	0.00	0.95		0.86	0.00				
Avail Cap(c_a), veh/h	507	2388	0	0	1382		415	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	27.0	7.8	0.0	0.0	26.7	0.0	32.5	0.0	0.0			
Incr Delay (d2), s/veh	503.3	0.2	0.0	0.0	14.5	0.0	16.5	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	76.5	5.6	0.0	0.0	15.7	0.0	9.1	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	530.3	8.1	0.0	0.0	41.2	0.0	49.0	0.0	0.0			
LnGrp LOS	F	A	A	A	D		D	A				
Approach Vol, veh/h	2355			1316			A			355		
Approach Delay, s/veh	244.4			41.2			49.0			A		
Approach LOS	F			D			D					
Timer - Assigned Phs	1	2	4			6						
Phs Duration (G+Y+Rc), s	25.0	39.0	26.0			64.0						
Change Period (Y+Rc), s	5.0	6.0	6.0			6.0						
Max Green Setting (Gmax), s	20.0	33.0	20.0			58.0						
Max Q Clear Time (g_c+I1), s	23.0	34.3	20.0			18.9						
Green Ext Time (p_c), s	0.0	0.0	0.0			8.4						

Intersection Summary

HCM 6th Ctrl Delay	160.8
HCM 6th LOS	F

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frts						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	410	0	160	0	0	0	0	700	440	410	710	0
Future Volume (vph)	410	0	160	0	0	0	0	700	440	410	710	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.143		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3539	1583	269	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			229						489			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	456	0	178	0	0	0	0	778	489	456	789	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	456	0	178	0	0	0	0	778	489	456	789	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

7:00 am Baseline

Synchro 10 Report
Page 4

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

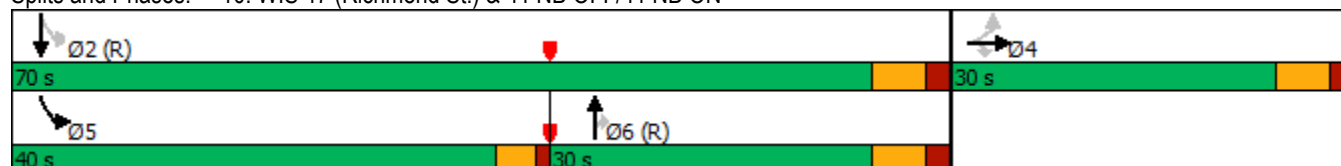
Maximum v/c Ratio: 0.85

Intersection Signal Delay: 19.5 Intersection LOS: B

Intersection Capacity Utilization 85.9%	ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 							 			 	
Traffic Volume (veh/h)	410	0	160	0	0	0	0	700	440	410	710	0
Future Volume (veh/h)	410	0	160	0	0	0	0	700	440	410	710	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	456	0	0				0	778	0	456	789	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1				0	2	2	1	1	0
Cap, veh/h	624	338					0	1211		814	2654	0
Arrive On Green	0.18	0.00	0.00				0.00	0.34	0.00	0.12	0.24	0.00
Sat Flow, veh/h	3483	1885	1598				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	456	0	0				0	778	0	456	789	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1777	1585	1795	1791	0
Q Serve(g_s), s	12.4	0.0	0.0				0.0	18.5	0.0	14.3	17.9	0.0
Cycle Q Clear(g_c), s	12.4	0.0	0.0				0.0	18.5	0.0	14.3	17.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	624	338					0	1211		814	2654	0
V/C Ratio(X)	0.73	0.00					0.00	0.64		0.56	0.30	0.00
Avail Cap(c_a), veh/h	906	490					0	1211		814	2654	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.56	0.56	0.00
Uniform Delay (d), s/veh	38.8	0.0	0.0				0.0	27.8	0.0	19.5	16.6	0.0
Incr Delay (d2), s/veh	1.7	0.0	0.0				0.0	2.6	0.0	1.6	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.4	0.0	0.0				0.0	8.1	0.0	7.0	8.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.5	0.0	0.0				0.0	30.4	0.0	21.0	16.7	0.0
LnGrp LOS	D	A					A	C		C	B	A
Approach Vol, veh/h	456		A					778	A	1245		
Approach Delay, s/veh	40.5							30.4		18.3		
Approach LOS	D							C		B		
Timer - Assigned Phs	2			4		5	6					
Phs Duration (G+Y+Rc), s	78.1			21.9		40.0	38.1					
Change Period (Y+Rc), s	6.0			6.0		4.0	6.0					
Max Green Setting (Gmax), s	64.0			24.0		36.0	24.0					
Max Q Clear Time (g_c+I1), s	19.9			14.4		16.3	20.5					
Green Ext Time (p_c), s	2.3			1.5		1.1	2.0					
Intersection Summary												
HCM 6th Ctrl Delay	26.2											
HCM 6th LOS	C											

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	280	0	340	460	650	0	0	840	680
Future Volume (vph)	0	0	0	280	0	340	460	650	0	0	840	680
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						250						565
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	322	0	391	529	747	0	0	966	782
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	322	0	391	529	747	0	0	966	782
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

7:00 am Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				19.3		19.3	72.7	72.7			32.0	32.0
Actuated g/C Ratio				0.19		0.19	0.73	0.73			0.32	0.32
v/c Ratio				0.49		0.77	0.72	0.29			0.85	0.88
Control Delay				37.6		23.9	12.3	1.1			40.6	21.6
Queue Delay				0.0		0.0	0.7	0.0			0.0	0.0
Total Delay				37.6		23.9	13.0	1.1			40.6	21.6
LOS				D		C	B	A			D	C
Approach Delay					30.1			6.0			32.1	
Approach LOS					C			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 22.8

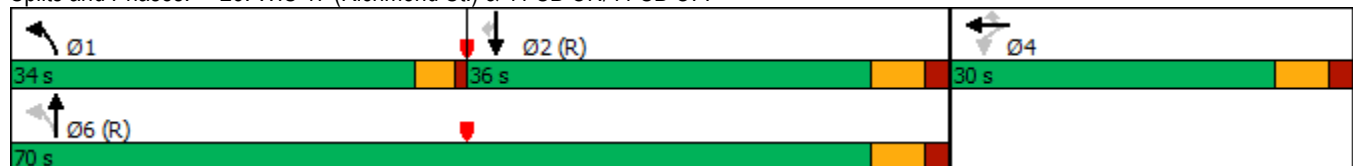
Intersection LOS: C

Intersection Capacity Utilization 85.9%

ICU Level of Service E

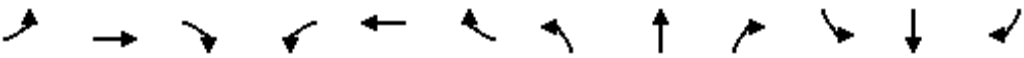
Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	280	0	340	460	650	0	0	840	680
Future Volume (veh/h)	0	0	0	280	0	340	460	650	0	0	840	680
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				322	0	0	529	747	0	0	966	0
Peak Hour Factor				0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				485	262		734	2793	0	0	1562	
Arrive On Green				0.14	0.00	0.00	0.60	1.00	0.00	0.00	0.44	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				322	0	0	529	747	0	0	966	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				8.8	0.0	0.0	10.7	0.0	0.0	0.0	20.9	0.0
Cycle Q Clear(g_c), s				8.8	0.0	0.0	10.7	0.0	0.0	0.0	20.9	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				485	262		734	2793	0	0	1562	
V/C Ratio(X)				0.66	0.00		0.72	0.27	0.00	0.00	0.62	
Avail Cap(c_a), veh/h				898	486		734	2793	0	0	1562	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.55	0.55	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				40.7	0.0	0.0	5.8	0.0	0.0	0.0	21.6	0.0
Incr Delay (d2), s/veh				1.6	0.0	0.0	3.4	0.1	0.0	0.0	1.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.8	0.0	0.0	2.9	0.1	0.0	0.0	8.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				42.3	0.0	0.0	9.2	0.1	0.0	0.0	23.4	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					322	A		1276			966	A
Approach Delay, s/veh					42.3			3.9			23.4	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	48.0		18.0		82.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	12.7	22.9		10.8		2.0						
Green Ext Time (p_c), s	1.3	4.4		1.2		2.2						

Intersection Summary

HCM 6th Ctrl Delay 16.1

HCM 6th LOS B

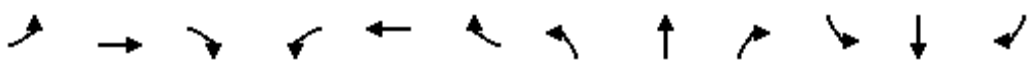
Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	240	0	920	160	1320	0	0	1150	760
Future Volume (vph)	0	0	0	240	0	920	160	1320	0	0	1150	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.103					
Satd. Flow (perm)	0	0	0	3433	1863	1583	194	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						757
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	289	0	1108	193	1590	0	0	1386	916
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	289	0	1108	193	1590	0	0	1386	916
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)				27.0	27.0	27.0	32.0	73.0			41.0	41.0
Total Split (%)				27.0%	27.0%	27.0%	32.0%	73.0%			41.0%	41.0%
Maximum Green (s)				21.0	21.0	21.0	28.0	67.0			35.0	35.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				23.0		23.0	69.0	69.0			37.0	37.0
Actuated g/C Ratio				0.23		0.23	0.69	0.69			0.37	0.37
v/c Ratio				0.37		2.63	0.33	0.64			1.06	0.86
Control Delay				34.0		757.1	10.8	4.2			73.7	15.2
Queue Delay				0.0		0.0	0.0	2.0			17.4	0.0
Total Delay				34.0		757.1	10.8	6.2			91.2	15.2
LOS				C		F	B	A			F	B
Approach Delay					607.5			6.7			61.0	
Approach LOS					F			A			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 68 (68%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.63

Intersection Signal Delay: 182.6

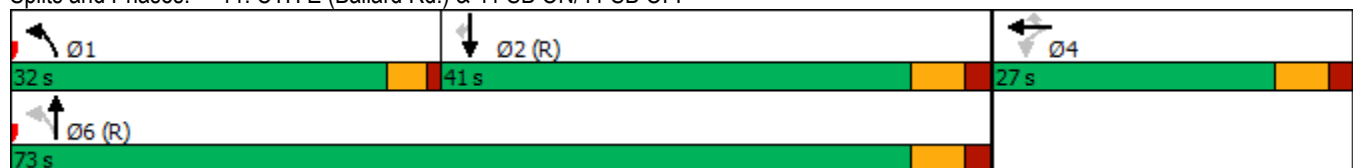
Intersection LOS: F

Intersection Capacity Utilization 109.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	240	0	920	160	1320	0	0	1150	760
Future Volume (veh/h)	0	0	0	240	0	920	160	1320	0	0	1150	760
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				289	0	0	193	1590	0	0	1386	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				795	430		575	2471	0	0	1315	
Arrive On Green				0.23	0.00	0.00	0.09	0.23	0.00	0.00	0.49	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				289	0	0	193	1590	0	0	1386	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				7.0	0.0	0.0	6.0	40.2	0.0	0.0	37.0	0.0
Cycle Q Clear(g_c), s				7.0	0.0	0.0	6.0	40.2	0.0	0.0	37.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				795	430		575	2471	0	0	1315	
V/C Ratio(X)				0.36	0.00		0.34	0.64	0.00	0.00	1.05	
Avail Cap(c_a), veh/h				795	430		575	2471	0	0	1315	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.33	0.33	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				32.4	0.0	0.0	21.2	27.5	0.0	0.0	25.4	0.0
Incr Delay (d2), s/veh				1.3	0.0	0.0	0.5	0.4	0.0	0.0	40.4	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.1	0.0	0.0	2.0	19.2	0.0	0.0	20.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				33.6	0.0	0.0	21.7	27.9	0.0	0.0	65.8	0.0
LnGrp LOS				C	A		C	C	A	A	F	
Approach Vol, veh/h					289	A		1783			1386	A
Approach Delay, s/veh					33.6			27.2			65.8	
Approach LOS					C			C			E	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	32.0	41.0		27.0		73.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	28.0	35.0		21.0		67.0						
Max Q Clear Time (g_c+I1), s	8.0	39.0		9.0		42.2						
Green Ext Time (p_c), s	0.4	0.0		1.4		5.9						

Intersection Summary

HCM 6th Ctrl Delay	43.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	740	0	380	0	0	0	0	740	280	1040	350	0
Future Volume (vph)	740	0	380	0	0	0	0	740	280	1040	350	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850							0.850		
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.131		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3574	1599	246	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			509						318			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	841	0	432	0	0	0	0	841	318	1182	398	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	841	0	432	0	0	0	0	841	318	1182	398	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	29.0	29.0	29.0					33.0	33.0	38.0	71.0	
Total Split (%)	29.0%	29.0%	29.0%					33.0%	33.0%	38.0%	71.0%	
Maximum Green (s)	23.0	23.0	23.0					27.0	27.0	34.0	65.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	25.4		25.4					28.6	28.6	66.6	66.6	
Actuated g/C Ratio	0.25		0.25					0.29	0.29	0.67	0.67	
v/c Ratio	0.96		0.55					0.82	0.46	1.72	0.17	
Control Delay	61.0		4.0					41.2	5.6	345.0	0.1	
Queue Delay	1.4		0.0					0.0	0.0	0.1	0.0	
Total Delay	62.4		4.0					41.2	5.6	345.1	0.1	
LOS	E		A					D	A	F	A	
Approach Delay		42.5						31.4			258.2	
Approach LOS		D						C			F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 10 (10%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.72

Intersection Signal Delay: 124.3

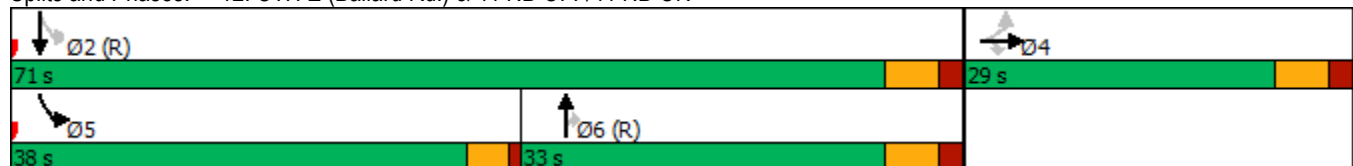
Intersection LOS: F

Intersection Capacity Utilization 109.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	740	0	380	0	0	0	0	740	280	1040	350	0
Future Volume (veh/h)	740	0	380	0	0	0	0	740	280	1040	350	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	841	0	0				0	841	0	1182	398	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	864	468					0	1039		738	2400	0
Arrive On Green	0.25	0.00	0.00				0.00	0.58	0.00	0.34	0.67	0.00
Sat Flow, veh/h	3456	1870	1585				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	841	0	0				0	841	0	1182	398	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1791	1598	1795	1791	0
Q Serve(g_s), s	24.1	0.0	0.0				0.0	18.6	0.0	34.0	4.1	0.0
Cycle Q Clear(g_c), s	24.1	0.0	0.0				0.0	18.6	0.0	34.0	4.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	864	468					0	1039		738	2400	0
V/C Ratio(X)	0.97	0.00					0.00	0.81		1.60	0.17	0.00
Avail Cap(c_a), veh/h	864	468					0	1039		738	2400	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.23	0.23	0.00
Uniform Delay (d), s/veh	37.2	0.0	0.0				0.0	18.8	0.0	23.4	6.1	0.0
Incr Delay (d2), s/veh	24.8	0.0	0.0				0.0	6.8	0.0	272.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.9	0.0	0.0				0.0	5.8	0.0	72.7	1.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.0	0.0	0.0				0.0	25.6	0.0	295.7	6.2	0.0
LnGrp LOS	E	A					A	C		F	A	A
Approach Vol, veh/h	841		A				841		A		1580	
Approach Delay, s/veh	62.0						25.6				222.8	
Approach LOS	E						C				F	
Timer - Assigned Phs	2		4		5		6					
Phs Duration (G+Y+Rc), s	71.0		29.0		38.0		33.0					
Change Period (Y+Rc), s	6.0		6.0		4.0		6.0					
Max Green Setting (Gmax), s	65.0		23.0		34.0		27.0					
Max Q Clear Time (g_c+I1), s	6.1		26.1		36.0		20.6					
Green Ext Time (p_c), s	1.1		0.0		0.0		3.0					
Intersection Summary												
HCM 6th Ctrl Delay			130.5									
HCM 6th LOS			F									
Notes												

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↗	↕			↕	↗
Traffic Volume (vph)	0	0	0	140	0	130	320	350	0	0	300	370
Future Volume (vph)	0	0	0	140	0	130	320	350	0	0	300	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3505	1568
Flt Permitted					0.950		0.549					
Satd. Flow (perm)	0	0	0	0	1787	1599	1033	3574	0	0	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						146						416
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	0	0	157	0	146	360	393	0	0	337	416
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	157	146	360	393	0	0	337	416
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					13.2	13.2	37.4	37.4			22.5	22.5
Actuated g/C Ratio					0.23	0.23	0.64	0.64			0.38	0.38
v/c Ratio					0.39	0.31	0.45	0.17			0.25	0.48
Control Delay					22.6	6.0	8.8	4.7			13.3	3.9
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					22.6	6.0	8.8	4.7			13.3	3.9
LOS					C	A	A	A			B	A
Approach Delay					14.6			6.7			8.2	
Approach LOS					B			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 58.6

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.48

Intersection Signal Delay: 8.6

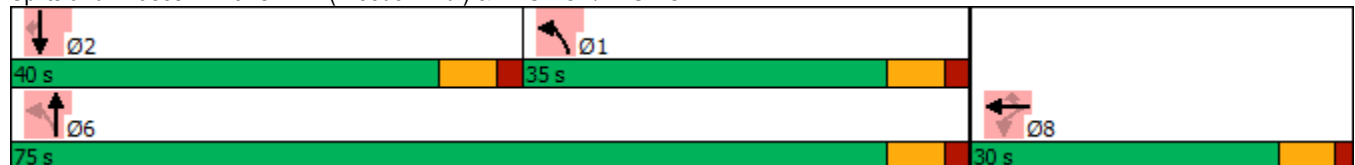
Intersection LOS: A

Intersection Capacity Utilization 59.0%

ICU Level of Service B

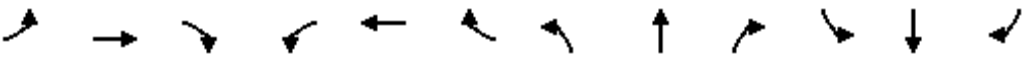
Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (veh/h)	0	0	0	140	0	130	320	350	0	0	300	370
Future Volume (veh/h)	0	0	0	140	0	130	320	350	0	0	300	370
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1856	1856
Adj Flow Rate, veh/h				157	0	0	360	393	0	0	337	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	3	3
Cap, veh/h				356	0		735	2361	0	0	1413	
Arrive On Green				0.20	0.00	0.00	0.19	0.66	0.00	0.00	0.40	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3618	1572
Grp Volume(v), veh/h				157	0	0	360	393	0	0	337	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1763	1572
Q Serve(g_s), s				4.3	0.0	0.0	0.0	2.4	0.0	0.0	3.6	0.0
Cycle Q Clear(g_c), s				4.3	0.0	0.0	0.0	2.4	0.0	0.0	3.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				356	0		735	2361	0	0	1413	
V/C Ratio(X)				0.44	0.00		0.49	0.17	0.00	0.00	0.24	
Avail Cap(c_a), veh/h				832	0		1390	4530	0	0	2261	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				19.8	0.0	0.0	13.1	3.7	0.0	0.0	11.1	0.0
Incr Delay (d2), s/veh				0.9	0.0	0.0	0.7	0.0	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.7	0.0	0.0	3.3	0.5	0.0	0.0	1.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				20.6	0.0	0.0	13.8	3.7	0.0	0.0	11.3	0.0
LnGrp LOS				C	A		B	A	A	A	B	
Approach Vol, veh/h					157	A		753			337	A
Approach Delay, s/veh					20.6			8.5			11.3	
Approach LOS					C			A			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		15.1				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.0	5.6				4.4		6.3				
Green Ext Time (p_c), s	2.4	2.3				1.9		0.5				

Intersection Summary

HCM 6th Ctrl Delay	10.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	0	180	0	0	0	0	520	220	180	260	0
Future Volume (vph)	150	0	180	0	0	0	0	520	220	180	260	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1736	1553	0	0	0	0	3471	1553	1736	3471	0
Flt Permitted		0.950								0.386		
Satd. Flow (perm)	0	1736	1553	0	0	0	0	3471	1553	705	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196						168			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
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 (%)	4%	4%	4%	1%	1%	1%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	163	0	196	0	0	0	0	565	239	196	283	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	163	196	0	0	0	0	565	239	196	283	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

7:00 am Baseline

Synchro 10 Report
Page 6

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effect Green (s)		13.9	13.9					22.6	22.6	37.5	37.5	
Actuated g/C Ratio		0.23	0.23					0.38	0.38	0.63	0.63	
v/c Ratio		0.40	0.38					0.43	0.34	0.31	0.13	
Control Delay		22.8	5.9					15.3	6.5	8.0	4.8	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		22.8	5.9					15.3	6.5	8.0	4.8	
LOS		C	A					B	A	A	A	
Approach Delay		13.6						12.7			6.1	
Approach LOS		B						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 59.4

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 11.0

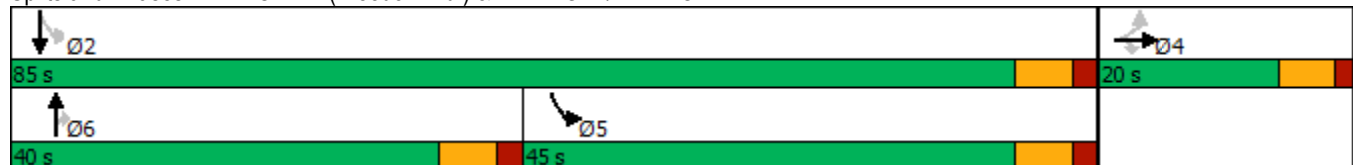
Intersection LOS: B

Intersection Capacity Utilization 59.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	150	0	180	0	0	0	0	520	220	180	260	0
Future Volume (veh/h)	150	0	180	0	0	0	0	520	220	180	260	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1841	1841	1841				0	1841	1841	1841	1841	0
Adj Flow Rate, veh/h	163	0	0				0	565	0	196	283	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4				0	4	4	4	4	0
Cap, veh/h	350	0					0	1400		626	2302	0
Arrive On Green	0.20	0.00	0.00				0.00	0.40	0.00	0.19	0.66	0.00
Sat Flow, veh/h	1753	0	1560				0	3589	1560	1753	3589	0
Grp Volume(v), veh/h	163	0	0				0	565	0	196	283	0
Grp Sat Flow(s),veh/h/ln	1753	0	1560				0	1749	1560	1753	1749	0
Q Serve(g_s), s	4.6	0.0	0.0				0.0	6.5	0.0	0.0	1.7	0.0
Cycle Q Clear(g_c), s	4.6	0.0	0.0				0.0	6.5	0.0	0.0	1.7	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	350	0					0	1400		626	2302	0
V/C Ratio(X)	0.47	0.00					0.00	0.40		0.31	0.12	0.00
Avail Cap(c_a), veh/h	499	0					0	2240		1577	5040	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.9	0.0	0.0				0.0	12.1	0.0	13.6	3.6	0.0
Incr Delay (d2), s/veh	1.4	0.0	0.0				0.0	0.2	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	0.0				0.0	2.2	0.0	1.8	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.2	0.0	0.0				0.0	12.2	0.0	14.0	3.6	0.0
LnGrp LOS	C	A					A	B		B	A	A
Approach Vol, veh/h	163		A				565		A		479	
Approach Delay, s/veh	21.2						12.2				7.9	
Approach LOS	C						B				A	
Timer - Assigned Phs	2		4		5		6					
Phs Duration (G+Y+Rc), s	41.0		15.2		14.5		26.5					
Change Period (Y+Rc), s	6.5		6.0		6.5		6.5					
Max Green Setting (Gmax), s	78.5		14.0		38.5		33.5					
Max Q Clear Time (g_c+I1), s	3.7		6.6		2.0		8.5					
Green Ext Time (p_c), s	1.3		0.5		1.3		2.7					
Intersection Summary												
HCM 6th Ctrl Delay			11.7									
HCM 6th LOS			B									
Notes												

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	150	0	120	90	150	0	0	390	100
Future Volume (vph)	0	0	0	150	0	120	90	150	0	0	390	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.940							0.850
Flt Protected					0.973		0.950					
Satd. Flow (prot)	0	0	0	0	1704	0	1787	1881	0	0	1863	1583
Flt Permitted					0.973		0.950					
Satd. Flow (perm)	0	0	0	0	1704	0	1787	1881	0	0	1863	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
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
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	176	0	141	106	176	0	0	459	118
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	317	0	106	176	0	0	459	118
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.2%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	12.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	150	0	120	90	150	0	0	390	100
Future Vol, veh/h	0	0	0	150	0	120	90	150	0	0	390	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	2	2	2
Mvmt Flow	0	0	0	176	0	141	106	176	0	0	459	118
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				906	965	176	577	0	-	-	-	0
Stage 1				388	388	-	-	-	-	-	-	-
Stage 2				518	577	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.11	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.209	-	-	-	-	-
Pot Cap-1 Maneuver				307	255	867	1001	-	0	0	-	-
Stage 1				686	609	-	-	-	0	0	-	-
Stage 2				598	502	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				274	0	867	1001	-	-	-	-	-
Mov Cap-2 Maneuver				274	0	-	-	-	-	-	-	-
Stage 1				613	0	-	-	-	-	-	-	-
Stage 2				598	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				42.8		3.4		0				
HCM LOS				E								
Minor Lane/Major Mvmt		NBL	NBTWBLn1	SBT	SBR							
Capacity (veh/h)		1001	-	394	-	-						
HCM Lane V/C Ratio		0.106	-	0.806	-	-						
HCM Control Delay (s)		9	-	42.8	-	-						
HCM Lane LOS		A	-	E	-	-						
HCM 95th %tile Q(veh)		0.4	-	7.1	-	-						

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	0	90	0	0	0	0	160	380	110	430	0
Future Volume (vph)	80	0	90	0	0	0	0	160	380	110	430	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.929							0.850			
Flt Protected		0.977								0.950		
Satd. Flow (prot)	0	1642	0	0	0	0	0	1863	1583	1787	1881	0
Flt Permitted		0.977								0.950		
Satd. Flow (perm)	0	1642	0	0	0	0	0	1863	1583	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	91	0	102	0	0	0	0	182	432	125	489	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	193	0	0	0	0	0	182	432	125	489	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.2%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	5.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↑	↗	↘	↑	
Traffic Vol, veh/h	80	0	90	0	0	0	0	160	380	110	430	0
Future Vol, veh/h	80	0	90	0	0	0	0	160	380	110	430	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	2	2	2	1	1	1
Mvmt Flow	91	0	102	0	0	0	0	182	432	125	489	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1137	1353	489	-	0	0	614	0	0
Stage 1	739	739	-	-	-	-	-	-	-
Stage 2	398	614	-	-	-	-	-	-	-
Critical Hdwy	6.45	6.55	6.25	-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.45	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.45	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	-	-	-	2.209	-	-
Pot Cap-1 Maneuver	220	148	573	0	-	-	970	-	0
Stage 1	467	419	-	0	-	-	-	-	0
Stage 2	672	478	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	192	0	573	-	-	-	970	-	-
Mov Cap-2 Maneuver	192	0	-	-	-	-	-	-	-
Stage 1	407	0	-	-	-	-	-	-	-
Stage 2	672	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	37.4	0	1.9
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	296	970	-
HCM Lane V/C Ratio	-	-	0.653	0.129	-
HCM Control Delay (s)	-	-	37.4	9.3	-
HCM Lane LOS	-	-	E	A	-
HCM 95th %tile Q(veh)	-	-	4.2	0.4	-

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	390	100	240	210	0	0	0	0	80	0	130
Future Volume (vph)	0	390	100	240	210	0	0	0	0	80	0	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850										0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	459	118	282	247	0	0	0	0	94	0	153
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	459	118	282	247	0	0	0	0	0	94	153
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type: Unsignalized												
Intersection Capacity Utilization 51.0%												
ICU Level of Service A												
Analysis Period (min) 15												

Intersection												
Int Delay, s/veh	9.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↑	↑	↑						↑	↑
Traffic Vol, veh/h	0	390	100	240	210	0	0	0	0	80	0	130
Future Vol, veh/h	0	390	100	240	210	0	0	0	0	80	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	459	118	282	247	0	0	0	0	94	0	153
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	577	0	0				1329	1388	247
Stage 1	-	-	-	-	-	-				811	811	-
Stage 2	-	-	-	-	-	-				518	577	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1001	-	0				171	143	792
Stage 1	0	-	-	-	-	0				437	393	-
Stage 2	0	-	-	-	-	0				598	502	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	-	-	-	1001	-	-				123	0	792
Mov Cap-2 Maneuver	-	-	-	-	-	-				123	0	-
Stage 1	-	-	-	-	-	-				314	0	-
Stage 2	-	-	-	-	-	-				598	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			5.3			42.7					
HCM LOS							E					
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1001	-	123	792						
HCM Lane V/C Ratio	-	-	0.282	-	0.765	0.193						
HCM Control Delay (s)	-	-	10	-	94.9	10.6						
HCM Lane LOS	-	-	B	-	F	B						
HCM 95th %tile Q(veh)	-	-	1.2	-	4.4	0.7						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	160	0	0	390	190	60	0	160	0	0	0
Future Volume (vph)	310	160	0	0	390	190	60	0	160	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	352	182	0	0	443	216	68	0	182	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	352	182	0	0	443	216	0	68	182	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	51.0%						ICU Level of Service A					
Analysis Period (min)	15											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	9.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	310	160	0	0	390	190	60	0	160	0	0	0
Future Vol, veh/h	310	160	0	0	390	190	60	0	160	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	352	182	0	0	443	216	68	0	182	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	659	0	-	-	-	0	1437	1545	182
Stage 1	-	-	-	-	-	-	886	886	-
Stage 2	-	-	-	-	-	-	551	659	-
Critical Hdwy	4.11	-	-	-	-	-	6.45	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45	5.55	-
Follow-up Hdwy	2.209	-	-	-	-	-	3.545	4.045	3.345
Pot Cap-1 Maneuver	934	-	0	0	-	-	145	113	853
Stage 1	-	-	0	0	-	-	398	359	-
Stage 2	-	-	0	0	-	-	571	456	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	934	-	-	-	-	-	90	0	853
Mov Cap-2 Maneuver	-	-	-	-	-	-	90	0	-
Stage 1	-	-	-	-	-	-	248	0	-
Stage 2	-	-	-	-	-	-	571	0	-

Approach	EB	WB	NB
HCM Control Delay, s	7.4	0	40.1
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR
Capacity (veh/h)	90	853	934	-	-	-
HCM Lane V/C Ratio	0.758	0.213	0.377	-	-	-
HCM Control Delay (s)	119.3	10.4	11.2	-	-	-
HCM Lane LOS	F	B	B	-	-	-
HCM 95th %tile Q(veh)	3.9	0.8	1.8	-	-	-

APPENDIX O10

Year 2048 No Build with Retimings Synchro PM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	1020	440	340	430	0	0	0	0	180	0	370
Future Volume (vph)	0	1020	440	340	430	0	0	0	0	180	0	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	0		215
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1827	1553	1719	1810	0	0	0	0	0	1787	1599
Flt Permitted				0.097							0.950	
Satd. Flow (perm)	0	1827	1553	176	1810	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			271									364
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1229	530	410	518	0	0	0	0	217	0	446
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1229	530	410	518	0	0	0	0	0	217	446
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		30			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		41.0	41.0	24.0	65.0					35.0	35.0	35.0
Total Split (%)		41.0%	41.0%	24.0%	65.0%					35.0%	35.0%	35.0%
Maximum Green (s)		34.5	34.5	17.5	58.5					29.0	29.0	29.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		37.1	37.1	61.2	61.2						18.6	18.6
Actuated g/C Ratio		0.42	0.42	0.70	0.70						0.21	0.21
v/c Ratio		1.59	0.65	0.86	0.41						0.57	0.71
Control Delay		297.0	14.6	47.6	7.7						37.0	13.5
Queue Delay		0.0	0.0	0.0	0.9						0.0	0.0
Total Delay		297.0	14.6	47.6	8.6						37.0	13.5
LOS		F	B	D	A						D	B
Approach Delay		211.9			25.8						21.2	
Approach LOS		F			C						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 87.9

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.59

Intersection Signal Delay: 122.6

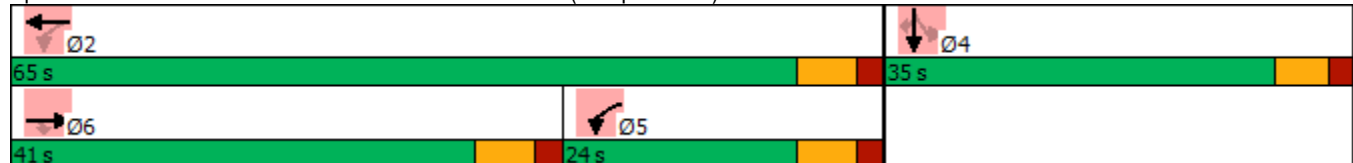
Intersection LOS: F

Intersection Capacity Utilization 92.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

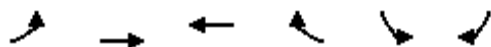
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	1020	440	340	430	0	0	0	0	180	0	370
Future Volume (veh/h)	0	1020	440	340	430	0	0	0	0	180	0	370
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1826	1826	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1229	530	410	518	0				217	0	446
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	4	4	5	5	0				1	1	1
Cap, veh/h	0	682	578	421	1116	0				554	0	493
Arrive On Green	0.00	0.37	0.37	0.20	0.61	0.00				0.31	0.00	0.31
Sat Flow, veh/h	0	1841	1560	1739	1826	0				1795	0	1598
Grp Volume(v), veh/h	0	1229	530	410	518	0				217	0	446
Grp Sat Flow(s),veh/h/ln	0	1841	1560	1739	1826	0				1795	0	1598
Q Serve(g_s), s	0.0	37.0	32.3	19.2	15.4	0.0				9.5	0.0	26.7
Cycle Q Clear(g_c), s	0.0	37.0	32.3	19.2	15.4	0.0				9.5	0.0	26.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	682	578	421	1116	0				554	0	493
V/C Ratio(X)	0.00	1.80	0.92	0.98	0.46	0.00				0.39	0.00	0.90
Avail Cap(c_a), veh/h	0	682	578	421	1116	0				558	0	496
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	31.4	29.9	37.9	10.5	0.0				27.1	0.0	33.1
Incr Delay (d2), s/veh	0.0	366.5	19.8	37.2	0.4	0.0				0.5	0.0	19.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	85.3	14.9	14.1	5.8	0.0				4.1	0.0	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	397.9	49.8	75.1	11.0	0.0				27.6	0.0	52.9
LnGrp LOS	A	F	D	E	B	A				C	A	D
Approach Vol, veh/h		1759			928						663	
Approach Delay, s/veh		293.0			39.3						44.6	
Approach LOS		F			D						D	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		65.0		34.8	24.0	41.0						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		58.5		29.0	17.5	34.5						
Max Q Clear Time (g_c+I1), s		17.4		28.7	21.2	39.0						
Green Ext Time (p_c), s		3.9		0.1	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			173.6									
HCM 6th LOS			F									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	780	420	770	180	0	0
Future Volume (vph)	780	420	770	180	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1845	1568	0	0
Flt Permitted	0.120					
Satd. Flow (perm)	224	1863	1845	1568	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				186		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	3%	3%	1%	1%
Adj. Flow (vph)	804	433	794	186	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	804	433	794	186	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0		
Minimum Split (s)	13.5	26.5	26.5	26.5		

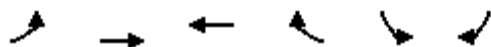
5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	33.0	33.0		
Total Split (%)	38.0%	100.0%	33.0%	33.0%		
Maximum Green (s)	31.5	93.5	26.5	26.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	63.3	67.3	29.2	29.2		
Actuated g/C Ratio	0.94	1.00	0.43	0.43		
v/c Ratio	0.89	0.23	0.99	0.24		
Control Delay	27.2	0.3	53.6	3.3		
Queue Delay	0.5	0.0	0.0	0.0		
Total Delay	27.7	0.3	53.6	3.3		
LOS	C	A	D	A		
Approach Delay		18.1	44.0			
Approach LOS		B	D			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 67.3

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 29.6

Intersection LOS: C

Intersection Capacity Utilization 92.5%

ICU Level of Service F

Analysis Period (min) 15

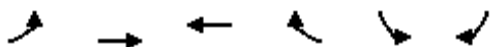
Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	780	420	770	180	0	0
Future Volume (veh/h)	780	420	770	180	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856		
Adj Flow Rate, veh/h	804	433	794	186		
Peak Hour Factor	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	3	3		
Cap, veh/h	904	1759	804	682		
Arrive On Green	0.45	0.94	0.43	0.43		
Sat Flow, veh/h	1781	1870	1856	1572		
Grp Volume(v), veh/h	804	433	794	186		
Grp Sat Flow(s),veh/h/ln	1781	1870	1856	1572		
Q Serve(g_s), s	23.1	1.2	28.3	5.1		
Cycle Q Clear(g_c), s	23.1	1.2	28.3	5.1		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	904	1759	804	682		
V/C Ratio(X)	0.89	0.25	0.99	0.27		
Avail Cap(c_a), veh/h	1013	2684	804	682		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	15.1	0.2	18.8	12.2		
Incr Delay (d2), s/veh	9.2	0.1	28.5	0.3		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	9.8	0.1	16.9	1.7		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.2	0.3	47.2	12.5		
LnGrp LOS	C	A	D	B		
Approach Vol, veh/h		1237	980			
Approach Delay, s/veh		15.8	40.6			
Approach LOS		B	D			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	33.9	33.0			66.9	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	26.5			93.5	
Max Q Clear Time (g_c+I1), s	25.1	30.3			3.2	
Green Ext Time (p_c), s	2.3	0.0			3.2	
Intersection Summary						
HCM 6th Ctrl Delay			26.8			
HCM 6th LOS			C			

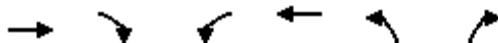
Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	420	0	0	740	210	410
Future Volume (vph)	420	0	0	740	210	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1845	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1845	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						340
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Adj. Flow (vph)	494	0	0	871	247	482
Shared Lane Traffic (%)						
Lane Group Flow (vph)	494	0	0	871	247	482
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Act Effect Green (s)	41.7			41.7	20.2	20.2
Actuated g/C Ratio	0.59			0.59	0.29	0.29
v/c Ratio	0.45			0.80	0.49	0.69
Control Delay	10.1			18.9	26.5	13.6
Queue Delay	0.1			0.0	0.0	0.0
Total Delay	10.2			18.9	26.5	13.6
LOS	B			B	C	B
Approach Delay	10.2			18.9	17.9	
Approach LOS	B			B	B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 70.5

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 16.5

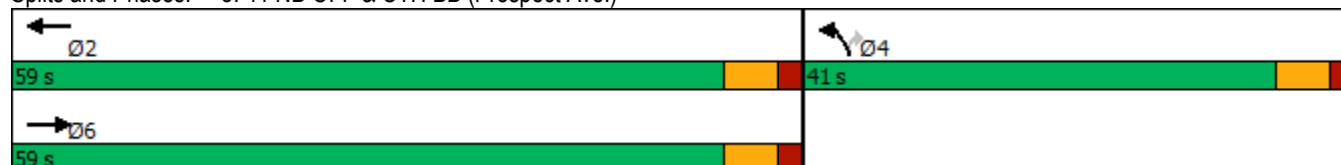
Intersection LOS: B

Intersection Capacity Utilization 57.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary 3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	420	0	0	740	210	410
Future Volume (veh/h)	420	0	0	740	210	410
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1856	1870	1870
Adj Flow Rate, veh/h	494	0	0	871	247	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	0	3	2	2
Cap, veh/h	1125	0	0	1116	421	
Arrive On Green	0.60	0.00	0.00	0.60	0.24	0.00
Sat Flow, veh/h	1870	0	0	1856	1781	1585
Grp Volume(v), veh/h	494	0	0	871	247	0
Grp Sat Flow(s),veh/h/ln	1870	0	0	1856	1781	1585
Q Serve(g_s), s	7.1	0.0	0.0	17.4	6.1	0.0
Cycle Q Clear(g_c), s	7.1	0.0	0.0	17.4	6.1	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1125	0	0	1116	421	
V/C Ratio(X)	0.44	0.00	0.00	0.78	0.59	
Avail Cap(c_a), veh/h	2085	0	0	2069	1336	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.3	0.0	0.0	7.4	16.7	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.7	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.0	4.8	2.3	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.7	0.0	0.0	9.1	18.0	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	494			871	247	A
Approach Delay, s/veh	5.7			9.1	18.0	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	33.7		15.7		33.7	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	19.4		8.1		9.1	
Green Ext Time (p_c), s	8.3		1.0		3.7	
Intersection Summary						
HCM 6th Ctrl Delay			9.4			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	1570	630	440	1550	0	0	0	0	220	0	270
Future Volume (vph)	0	1570	630	440	1550	0	0	0	0	220	0	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0		0	450		450
Storage Lanes	0		1	1		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			497									99
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	1635	656	458	1615	0	0	0	0	229	0	281
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	1635	656	458	1615	0	0	0	0	0	229	281
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	4.0	5.0					5.0	5.0	5.0
Minimum Split (s)		9.0	9.0	10.0	10.0					11.0	11.0	11.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	72.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	1.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-1.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		1.00	0.78	0.69	0.62					0.72	0.47	0.47
Control Delay		58.1	14.8	35.2	16.6					52.6	25.8	25.8
Queue Delay		0.0	0.0	0.0	0.3					0.0	0.0	0.0
Total Delay		58.1	14.8	35.2	16.9					52.6	25.8	25.8
LOS		E	B	D	B					D	C	C
Approach Delay		45.7			21.0					37.8		
Approach LOS		D			C					D		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 34.4

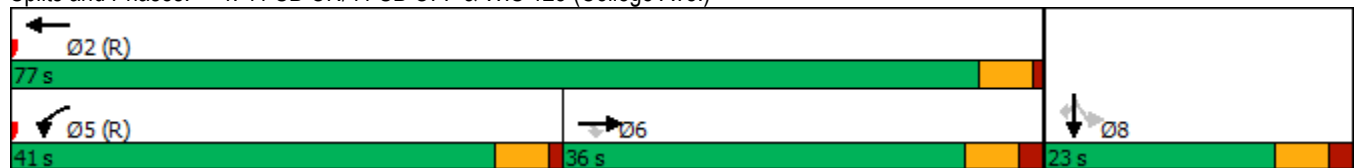
Intersection LOS: C

Intersection Capacity Utilization 92.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑					↖	↗	↗↗
Traffic Volume (veh/h)	0	1570	630	440	1550	0	0	0	0	220	0	270
Future Volume (veh/h)	0	1570	630	440	1550	0	0	0	0	220	0	270
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1856	1856	1856
Adj Flow Rate, veh/h	0	1635	0	458	1615	0				229	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	1	1	0				3	3	3
Cap, veh/h	0	2496		971	3797	0				672	0	
Arrive On Green	0.00	0.16	0.00	0.54	1.00	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1795	3676	0				3534	0	3145
Grp Volume(v), veh/h	0	1635	0	458	1615	0				229	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1795	1791	0				1767	0	1572
Q Serve(g_s), s	0.0	30.0	0.0	15.7	0.0	0.0				5.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	30.0	0.0	15.7	0.0	0.0				5.6	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2496		971	3797	0				672	0	
V/C Ratio(X)	0.00	0.65		0.47	0.43	0.00				0.34	0.00	
Avail Cap(c_a), veh/h	0	2496		971	3797	0				672	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	34.0	0.0	14.1	0.0	0.0				35.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.4	0.0	0.0	0.0	0.0				1.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	13.9	0.0	6.1	0.0	0.0				2.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	35.4	0.0	14.2	0.0	0.0				36.5	0.0	0.0
LnGrp LOS	A	D		B	A	A				D	A	
Approach Vol, veh/h		1635	A		2073						229	A
Approach Delay, s/veh		35.4			3.2						36.5	
Approach LOS		D			A						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		112.0			58.9	53.1		23.0				
Change Period (Y+Rc), s		* 6			5.0	6.0		6.0				
Max Green Setting (Gmax), s		* 72			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		2.0			17.7	32.0		7.6				
Green Ext Time (p_c), s		13.3			1.9	0.0		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			18.5									
HCM 6th LOS			B									
Notes												
User approved volume balancing among the lanes for turning movement.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	720	1070	0	0	1480	320	510	0	500	0	0	0
Future Volume (vph)	720	1070	0	0	1480	320	510	0	500	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.108						0.950					
Satd. Flow (perm)	203	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						330			270			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	742	1103	0	0	1526	330	526	0	515	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	742	1103	0	0	1526	330	526	0	515	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	41.0	78.0			37.0	37.0	22.0	22.0	22.0			
Total Split (%)	41.0%	78.0%			37.0%	37.0%	22.0%	22.0%	22.0%			
Maximum Green (s)	35.0	72.0			31.0	31.0	17.0	17.0	17.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	74.0	74.0			33.0	33.0	18.0		18.0			
Actuated g/C Ratio	0.74	0.74			0.33	0.33	0.18		0.18			
v/c Ratio	1.01	0.42			0.91	0.44	1.74		0.71			
Control Delay	62.0	11.1			41.4	4.9	375.4		24.1			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	62.0	11.1			41.4	4.9	375.4		24.1			
LOS	E	B			D	A	F		C			
Approach Delay	31.6				34.9		201.6					
Approach LOS	C				C		F					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.74

Intersection Signal Delay: 70.2

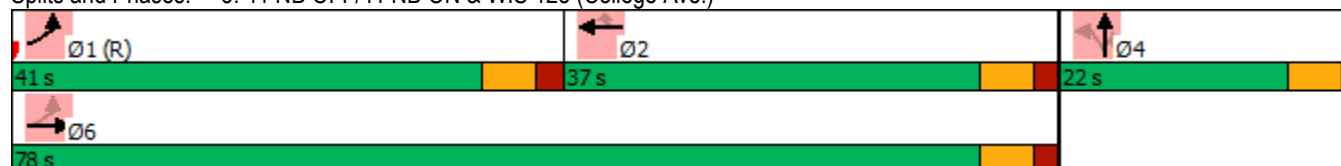
Intersection LOS: E

Intersection Capacity Utilization 92.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	720	1070	0	0	1480	320	510	0	500	0	0	0
Future Volume (veh/h)	720	1070	0	0	1480	320	510	0	500	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	742	1103	0	0	1526	0	526	0	0			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	748	2651	0	0	1685		641	0				
Arrive On Green	0.37	0.74	0.00	0.00	0.11	0.00	0.18	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	742	1103	0	0	1526	0	526	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	36.4	11.6	0.0	0.0	29.5	0.0	14.2	0.0	0.0			
Cycle Q Clear(g_c), s	36.4	11.6	0.0	0.0	29.5	0.0	14.2	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	748	2651	0	0	1685		641	0				
V/C Ratio(X)	0.99	0.42	0.00	0.00	0.91		0.82	0.00				
Avail Cap(c_a), veh/h	748	2651	0	0	1685		641	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	26.1	4.9	0.0	0.0	43.0	0.0	39.4	0.0	0.0			
Incr Delay (d2), s/veh	8.1	0.0	0.0	0.0	8.5	0.0	11.2	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	17.1	3.5	0.0	0.0	14.8	0.0	7.1	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.1	4.9	0.0	0.0	51.6	0.0	50.7	0.0	0.0			
LnGrp LOS	C	A	A	A	D		D	A				
Approach Vol, veh/h	1845			1526			A			526		
Approach Delay, s/veh	16.7			51.6			50.7			A		
Approach LOS	B			D			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	41.0	37.0		22.0		78.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	35.0	31.0		17.0		72.0						
Max Q Clear Time (g_c+I1), s	38.4	31.5		16.2		13.6						
Green Ext Time (p_c), s	0.0	0.0		0.2		6.8						

Intersection Summary

HCM 6th Ctrl Delay	34.9
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑						↑	↑
Traffic Volume (vph)	0	1760	560	640	1790	0	0	0	0	220	0	610
Future Volume (vph)	0	1760	560	640	1790	0	0	0	0	220	0	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	0	1787	1599
Flt Permitted				0.125							0.950	
Satd. Flow (perm)	0	5085	1583	233	3539	0	0	0	0	0	1787	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			473									76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1796	571	653	1827	0	0	0	0	224	0	622
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1796	571	653	1827	0	0	0	0	0	224	622
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	70.0	70.0						22.0	22.0
Actuated g/C Ratio		0.30	0.30	0.70	0.70						0.22	0.22
v/c Ratio		1.18	0.71	0.91	0.74						0.57	1.51
Control Delay		120.1	11.3	10.8	6.5						41.4	270.6
Queue Delay		0.4	0.0	47.5	48.6						0.0	0.0
Total Delay		120.5	11.3	58.3	55.1						41.4	270.6
LOS		F	B	E	E						D	F
Approach Delay		94.2			56.0						209.9	
Approach LOS		F			E						F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.51

Intersection Signal Delay: 94.7

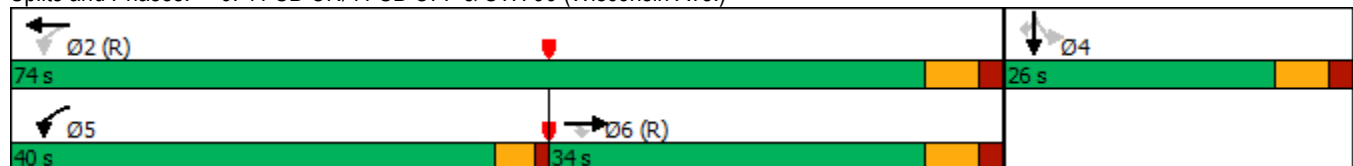
Intersection LOS: F

Intersection Capacity Utilization 140.7%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↗	↑↑						↖	↗
Traffic Volume (veh/h)	0	1760	560	640	1790	0	0	0	0	220	0	610
Future Volume (veh/h)	0	1760	560	640	1790	0	0	0	0	220	0	610
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1796	0	653	1827	0				224	0	622
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1532		713	2488	0				395	0	351
Arrive On Green	0.00	0.30	0.00	0.36	0.70	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	5274	1585	1781	3647	0				1795	0	1598
Grp Volume(v), veh/h	0	1796	0	653	1827	0				224	0	622
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1795	0	1598
Q Serve(g_s), s	0.0	30.0	0.0	30.7	31.7	0.0				11.1	0.0	22.0
Cycle Q Clear(g_c), s	0.0	30.0	0.0	30.7	31.7	0.0				11.1	0.0	22.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1532		713	2488	0				395	0	351
V/C Ratio(X)	0.00	1.17		0.92	0.73	0.00				0.57	0.00	1.77
Avail Cap(c_a), veh/h	0	1532		713	2488	0				395	0	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	35.0	0.0	24.9	9.3	0.0				34.8	0.0	39.0
Incr Delay (d2), s/veh	0.0	84.9	0.0	2.3	0.2	0.0				1.9	0.0	357.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	24.1	0.0	14.6	10.3	0.0				5.0	0.0	52.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	119.9	0.0	27.2	9.4	0.0				36.7	0.0	396.8
LnGrp LOS	A	F		C	A	A				D	A	F
Approach Vol, veh/h		1796	A		2480						846	
Approach Delay, s/veh		119.9			14.1						301.4	
Approach LOS		F			B						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.0		26.0	40.0	34.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		33.7		24.0	32.7	32.0						
Green Ext Time (p_c), s		21.0		0.0	0.7	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			98.7									
HCM 6th LOS			F									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  							
Traffic Volume (vph)	830	1150	0	0	1930	320	500	0	500	0	0	0
Future Volume (vph)	830	1150	0	0	1930	320	500	0	500	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Flt Permitted	0.125						0.950					
Satd. Flow (perm)	233	3539	0	0	5085	1583	1681	1770	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						327			119			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	847	1173	0	0	1969	327	510	0	510	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	847	1173	0	0	1969	327	510	0	510	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	1.18	0.47			1.29	0.47	1.38		1.16			
Control Delay	97.2	3.0			167.5	5.4	220.6		122.0			
Queue Delay	1.8	24.6			0.6	0.0	0.0		0.0			
Total Delay	99.0	27.6			168.1	5.4	220.6		122.0			
LOS	F	C			F	A	F		F			
Approach Delay	57.6				145.0				171.3			
Approach LOS	E				F				F			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.38

Intersection Signal Delay: 116.9

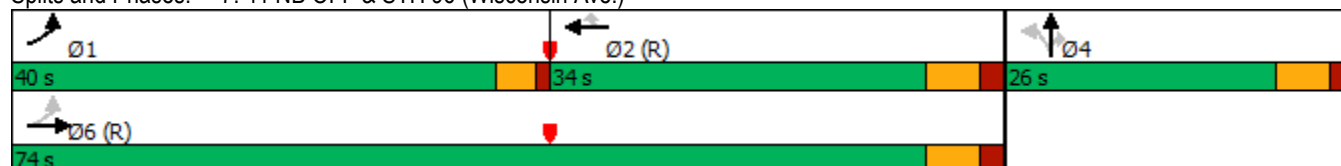
Intersection LOS: F

Intersection Capacity Utilization 140.7%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	830	1150	0	0	1930	320	500	0	500	0	0	0
Future Volume (veh/h)	830	1150	0	0	1930	320	500	0	500	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	847	1173	0	0	1969	327	510	0	0			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	713	2607	0	0	1704	529	664	0				
Arrive On Green	0.12	0.24	0.00	0.00	0.33	0.33	0.19	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	5274	1585	3563	0	1585			
Grp Volume(v), veh/h	847	1173	0	0	1969	327	510	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	36.0	28.1	0.0	0.0	33.4	17.3	13.6	0.0	0.0			
Cycle Q Clear(g_c), s	36.0	28.1	0.0	0.0	33.4	17.3	13.6	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	713	2607	0	0	1704	529	664	0				
V/C Ratio(X)	1.19	0.45	0.00	0.00	1.16	0.62	0.77	0.00				
Avail Cap(c_a), veh/h	713	2607	0	0	1704	529	784	0				
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	39.2	20.7	0.0	0.0	33.3	28.0	38.6	0.0	0.0			
Incr Delay (d2), s/veh	85.8	0.1	0.0	0.0	77.2	5.3	3.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	36.0	13.3	0.0	0.0	25.5	7.2	6.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	124.9	20.8	0.0	0.0	110.5	33.3	42.6	0.0	0.0			
LnGrp LOS	F	C	A	A	F	C	D	A				
Approach Vol, veh/h	2020			2296			510			A		
Approach Delay, s/veh	64.5			99.5			42.6					
Approach LOS	E			F			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	37.4		22.6		77.4						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	38.0	35.4		15.6		30.1						
Green Ext Time (p_c), s	0.0	0.0		1.0		11.5						

Intersection Summary

HCM 6th Ctrl Delay 78.8

HCM 6th LOS E

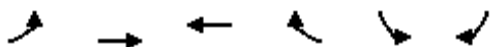
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019

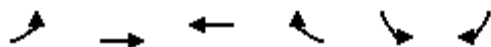


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	320	2150	1470	570	180	1200
Future Volume (vph)	320	2150	1470	570	180	1200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			350	0	200
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3574	1599	1752	1568
Flt Permitted	0.093				0.950	
Satd. Flow (perm)	173	3539	3574	1599	1752	1568
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				648		312
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	364	2443	1670	648	205	1364
Shared Lane Traffic (%)						
Lane Group Flow (vph)	364	2443	1670	648	205	1364
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	16.0

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	20.0	64.0	44.0	44.0	31.0	31.0
Total Split (%)	21.1%	67.4%	46.3%	46.3%	32.6%	32.6%
Maximum Green (s)	15.0	58.0	38.0	38.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	60.0	60.0	40.0	40.0	27.0	27.0
Actuated g/C Ratio	0.63	0.63	0.42	0.42	0.28	0.28
v/c Ratio	0.96	1.09	1.11	0.62	0.41	2.04
Control Delay	64.5	69.4	70.0	7.5	30.6	493.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.5	69.4	70.0	7.5	30.6	493.4
LOS	E	E	E	A	C	F
Approach Delay	68.8		52.6		433.0	
Approach LOS	E		D		F	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.04

Intersection Signal Delay: 148.5

Intersection LOS: F

Intersection Capacity Utilization 121.6%

ICU Level of Service H

Analysis Period (min) 15

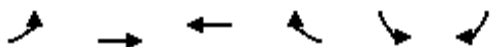
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	320	2150	1470	570	180	1200
Future Volume (veh/h)	320	2150	1470	570	180	1200
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	364	2443	1670	0	205	0
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	398	2683	1956		284	
Arrive On Green	0.33	1.00	0.18	0.00	0.16	0.00
Sat Flow, veh/h	1781	3647	3676	1598	1767	1572
Grp Volume(v), veh/h	364	2443	1670	0	205	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1767	1572
Q Serve(g_s), s	12.8	0.0	42.9	0.0	10.5	0.0
Cycle Q Clear(g_c), s	12.8	0.0	42.9	0.0	10.5	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	398	2683	1956		284	
V/C Ratio(X)	0.92	0.91	0.85		0.72	
Avail Cap(c_a), veh/h	401	2683	1956		502	
HCM Platoon Ratio	2.00	2.00	0.33	0.33	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	0.00
Uniform Delay (d), s/veh	21.3	0.0	35.3	0.0	37.8	0.0
Incr Delay (d2), s/veh	25.2	6.0	0.5	0.0	4.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	2.2	20.6	0.0	4.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.6	6.0	35.7	0.0	42.7	0.0
LnGrp LOS	D	A	D		D	
Approach Vol, veh/h		2807	1670	A	205	A
Approach Delay, s/veh		11.2	35.7		42.7	
Approach LOS		B	D		D	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	19.8	55.9		19.3		75.7
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	15.0	38.0		25.0		58.0
Max Q Clear Time (g_c+I1), s	14.8	44.9		12.5		2.0
Green Ext Time (p_c), s	0.0	0.0		0.9		43.0

Intersection Summary

HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Future Volume (vph)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	0		670	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1780	3574	0	0	3574	1599	0	1752	1568	0	0	0
Flt Permitted	0.125							0.950				
Satd. Flow (perm)	234	3574	0	0	3574	1599	0	1752	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						318			408			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
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
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	1326	1207	0	0	1761	370	457	0	978	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1326	1207	0	0	1761	370	0	457	978	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm	NA	Free			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	31.0	64.0			33.0	33.0	31.0	31.0				
Total Split (%)	32.6%	67.4%			34.7%	34.7%	32.6%	32.6%				
Maximum Green (s)	26.0	58.0			27.0	27.0	25.0	25.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0		-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	60.1	60.1			29.0	29.0		26.9	95.0			
Actuated g/C Ratio	0.63	0.63			0.31	0.31		0.28	1.00			
v/c Ratio	2.26	0.53			1.61	0.52		0.92	0.62			
Control Delay	583.1	5.0			307.4	8.0		59.6	1.9			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	583.1	5.0			307.4	8.0		59.6	1.9			
LOS	F	A			F	A		E	A			
Approach Delay	307.6				255.4		20.3					
Approach LOS	F				F		C					

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 54 (57%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.26

Intersection Signal Delay: 221.8

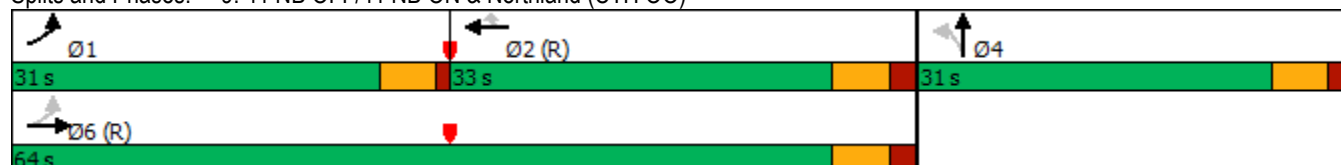
Intersection LOS: F

Intersection Capacity Utilization 145.6%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Future Volume (veh/h)	1220	1110	0	0	1620	340	420	0	900	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856			
Adj Flow Rate, veh/h	1326	1207	0	0	1761	0	457	0	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3			
Cap, veh/h	586	2262	0	0	1093		502	0				
Arrive On Green	0.47	1.00	0.00	0.00	0.10	0.00	0.28	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	3676	1598	1767	0	1572			
Grp Volume(v), veh/h	1326	1207	0	0	1761	0	457	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1791	1598	1767	0	1572			
Q Serve(g_s), s	27.0	0.0	0.0	0.0	29.0	0.0	23.7	0.0	0.0			
Cycle Q Clear(g_c), s	27.0	0.0	0.0	0.0	29.0	0.0	23.7	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	586	2262	0	0	1093		502	0				
V/C Ratio(X)	2.26	0.53	0.00	0.00	1.61		0.91	0.00				
Avail Cap(c_a), veh/h	586	2262	0	0	1093		502	0				
HCM Platoon Ratio	1.67	1.67	1.00	1.00	0.33	0.33	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	18.3	0.0	0.0	0.0	42.7	0.0	32.8	0.0	0.0			
Incr Delay (d2), s/veh	568.6	0.1	0.0	0.0	279.0	0.0	20.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	101.8	0.0	0.0	0.0	56.2	0.0	12.8	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	586.9	0.1	0.0	0.0	321.7	0.0	53.7	0.0	0.0			
LnGrp LOS	F	A	A	A	F		D	A				
Approach Vol, veh/h	2533		1761			A	457		A			
Approach Delay, s/veh	307.3		321.7				53.7					
Approach LOS	F		F				D					
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	31.0	33.0	31.0		64.0							
Change Period (Y+Rc), s	5.0	6.0	6.0		6.0							
Max Green Setting (Gmax), s	26.0	27.0	25.0		58.0							
Max Q Clear Time (g_c+I1), s	29.0	31.0	25.7		2.0							
Green Ext Time (p_c), s	0.0	0.0	0.0		7.8							
Intersection Summary												
HCM 6th Ctrl Delay	288.3											
HCM 6th LOS	F											

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frts						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	710	0	290	0	0	0	0	1130	530	420	1240	0
Future Volume (vph)	710	0	290	0	0	0	0	1130	530	420	1240	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	0		0	0		245	25		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3433	1863	1583	0	0	0	0	3539	1583	1787	3574	0
Flt Permitted	0.950									0.108		
Satd. Flow (perm)	3433	1863	1583	0	0	0	0	3539	1583	203	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			80						534			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	763	0	312	0	0	0	0	1215	570	452	1333	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	763	0	312	0	0	0	0	1215	570	452	1333	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	28.0	28.0	28.0					39.0	39.0	33.0	72.0	
Total Split (%)	28.0%	28.0%	28.0%					39.0%	39.0%	33.0%	72.0%	
Maximum Green (s)	22.0	22.0	22.0					33.0	33.0	29.0	66.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effect Green (s)	24.0		24.0					35.0	35.0	68.0	68.0	
Actuated g/C Ratio	0.24		0.24					0.35	0.35	0.68	0.68	
v/c Ratio	0.93		0.71					0.98	0.63	0.76	0.55	
Control Delay	55.9		35.6					54.5	6.6	16.3	0.8	
Queue Delay	3.8		0.0					1.8	0.0	0.4	0.5	
Total Delay	59.7		35.6					56.3	6.6	16.7	1.3	
LOS	E		D					E	A	B	A	
Approach Delay		52.7						40.5			5.2	
Approach LOS		D						D			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 29.8

Intersection LOS: C

Intersection Capacity Utilization 86.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	710	0	290	0	0	0	0	1130	530	420	1240	0
Future Volume (veh/h)	710	0	290	0	0	0	0	1130	530	420	1240	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	763	0	0				0	1215	0	452	1333	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2				0	2	2	1	1	0
Cap, veh/h	829	449					0	1244		593	2436	0
Arrive On Green	0.24	0.00	0.00				0.00	0.35	0.00	0.19	0.46	0.00
Sat Flow, veh/h	3456	1870	1585				0	3647	1585	1795	3676	0
Grp Volume(v), veh/h	763	0	0				0	1215	0	452	1333	0
Grp Sat Flow(s),veh/h/ln	1728	1870	1585				0	1777	1585	1795	1791	0
Q Serve(g_s), s	21.5	0.0	0.0				0.0	33.8	0.0	19.6	27.0	0.0
Cycle Q Clear(g_c), s	21.5	0.0	0.0				0.0	33.8	0.0	19.6	27.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	829	449					0	1244		593	2436	0
V/C Ratio(X)	0.92	0.00					0.00	0.98		0.76	0.55	0.00
Avail Cap(c_a), veh/h	829	449					0	1244		593	2436	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.21	0.21	0.00
Uniform Delay (d), s/veh	37.1	0.0	0.0				0.0	32.1	0.0	29.2	16.1	0.0
Incr Delay (d2), s/veh	15.3	0.0	0.0				0.0	20.5	0.0	2.0	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.7	0.0	0.0				0.0	17.5	0.0	6.6	11.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	52.4	0.0	0.0				0.0	52.6	0.0	31.2	16.2	0.0
LnGrp LOS	D	A					A	D		C	B	A
Approach Vol, veh/h	763			A			1215			A		
Approach Delay, s/veh	52.4						52.6			20.0		
Approach LOS	D						D			C		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	72.0			28.0			33.0			39.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	66.0			22.0			29.0			33.0		
Max Q Clear Time (g_c+I1), s	29.0			23.5			21.6			35.8		
Green Ext Time (p_c), s	4.7			0.0			0.7			0.0		

Intersection Summary

HCM 6th Ctrl Delay	37.1
HCM 6th LOS	D

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↑	↗	↖	↑↑			↑↑	↗
Traffic Volume (vph)	0	0	0	540	0	420	260	1580	0	0	1120	470
Future Volume (vph)	0	0	0	540	0	420	260	1580	0	0	1120	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		100	25		0	0		250
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3433	1863	1583	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.118					
Satd. Flow (perm)	0	0	0	3433	1863	1583	222	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						464
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	593	0	462	286	1736	0	0	1231	516
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	593	0	462	286	1736	0	0	1231	516
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

5:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				26.0		26.0	66.0	66.0			32.0	32.0
Actuated g/C Ratio				0.26		0.26	0.66	0.66			0.32	0.32
v/c Ratio				0.66		0.99	0.46	0.74			1.09	0.63
Control Delay				37.4		71.4	11.5	5.0			87.3	7.9
Queue Delay				0.0		0.0	0.0	3.3			0.0	0.0
Total Delay				37.4		71.4	11.5	8.3			87.3	7.9
LOS				D		E	B	A			F	A
Approach Delay					52.3			8.8			63.9	
Approach LOS					D			A			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 38.2

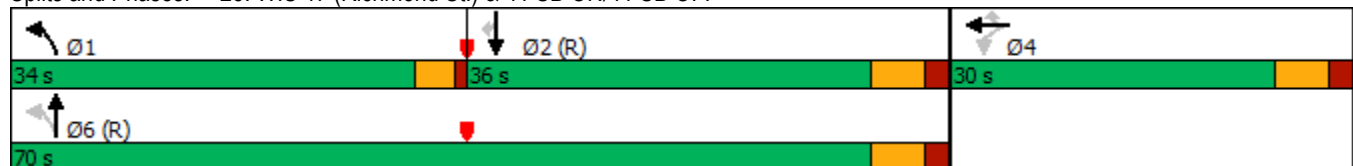
Intersection LOS: D

Intersection Capacity Utilization 86.3%

ICU Level of Service E

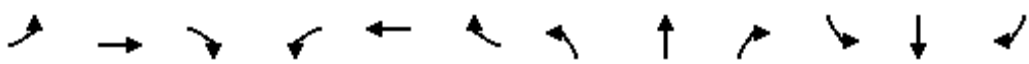
Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	540	0	420	260	1580	0	0	1120	470
Future Volume (veh/h)	0	0	0	540	0	420	260	1580	0	0	1120	470
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				593	0	0	286	1736	0	0	1231	0
Peak Hour Factor				0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				751	406		613	2517	0	0	1289	
Arrive On Green				0.22	0.00	0.00	0.30	0.70	0.00	0.00	0.36	0.00
Sat Flow, veh/h				3456	1870	1585	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				593	0	0	286	1736	0	0	1231	0
Grp Sat Flow(s),veh/h/ln				1728	1870	1585	1795	1791	0	0	1777	1585
Q Serve(g_s), s				16.2	0.0	0.0	8.3	28.0	0.0	0.0	33.8	0.0
Cycle Q Clear(g_c), s				16.2	0.0	0.0	8.3	28.0	0.0	0.0	33.8	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				751	406		613	2517	0	0	1289	
V/C Ratio(X)				0.79	0.00		0.47	0.69	0.00	0.00	0.96	
Avail Cap(c_a), veh/h				898	486		613	2517	0	0	1289	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.18	0.18	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				37.0	0.0	0.0	17.6	8.6	0.0	0.0	31.1	0.0
Incr Delay (d2), s/veh				4.0	0.0	0.0	0.5	0.3	0.0	0.0	16.4	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				7.2	0.0	0.0	5.3	9.2	0.0	0.0	16.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				41.0	0.0	0.0	18.0	8.9	0.0	0.0	47.5	0.0
LnGrp LOS				D	A		B	A	A	A	D	
Approach Vol, veh/h					593	A		2022			1231	A
Approach Delay, s/veh					41.0			10.2			47.5	
Approach LOS					D			B			D	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	40.3		25.7		74.3						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	10.3	35.8		18.2		30.0						
Green Ext Time (p_c), s	0.6	0.0		1.5		7.2						
Intersection Summary												
HCM 6th Ctrl Delay				26.9								
HCM 6th LOS				C								
Notes												
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	250	0	710	490	1340	0	0	1520	910
Future Volume (vph)	0	0	0	250	0	710	490	1340	0	0	1520	910
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		210	0		0	0		410
Storage Lanes	0		0	2		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	3467	1881	1599	1787	3574	0	0	3539	1583
Flt Permitted				0.950			0.078					
Satd. Flow (perm)	0	0	0	3467	1881	1599	147	3574	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						89						372
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	281	0	798	551	1506	0	0	1708	1022
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	281	0	798	551	1506	0	0	1708	1022
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			18			28	
Link Offset(ft)		0			0			0			6	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				16.0	16.0	16.0	31.0	84.0			53.0	53.0
Total Split (%)				16.0%	16.0%	16.0%	31.0%	84.0%			53.0%	53.0%
Maximum Green (s)				10.0	10.0	10.0	27.0	78.0			47.0	47.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Max	Max	Max	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				12.0		12.0	80.0	80.0			49.0	49.0
Actuated g/C Ratio				0.12		0.12	0.80	0.80			0.49	0.49
v/c Ratio				0.68		2.96	0.98	0.53			0.99	1.06
Control Delay				51.0		906.8	38.4	6.9			44.3	63.9
Queue Delay				0.0		0.0	0.0	3.6			0.0	0.0
Total Delay				51.0		906.8	38.4	10.5			44.3	63.9
LOS				D		F	D	B			D	E
Approach Delay					683.9			18.0			51.6	
Approach LOS					F			B			D	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 69 (69%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.96

Intersection Signal Delay: 156.2

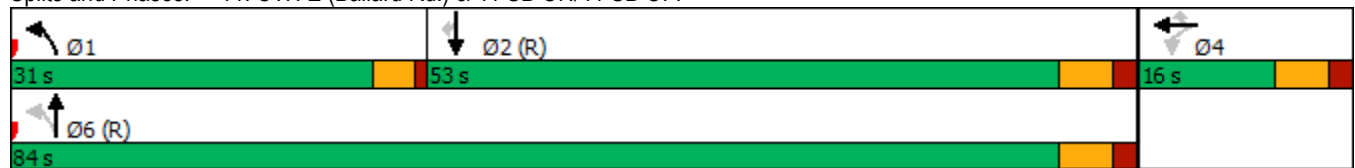
Intersection LOS: F

Intersection Capacity Utilization 101.8%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔↔	↑	↗	↗	↑↑			↑↑	↗
Traffic Volume (veh/h)	0	0	0	250	0	710	490	1340	0	0	1520	910
Future Volume (veh/h)	0	0	0	250	0	710	490	1340	0	0	1520	910
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				281	0	0	551	1506	0	0	1708	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				418	226		558	2865	0	0	1741	
Arrive On Green				0.12	0.00	0.00	0.27	0.80	0.00	0.00	0.65	0.00
Sat Flow, veh/h				3483	1885	1598	1795	3676	0	0	3647	1585
Grp Volume(v), veh/h				281	0	0	551	1506	0	0	1708	0
Grp Sat Flow(s),veh/h/ln				1742	1885	1598	1795	1791	0	0	1777	1585
Q Serve(g_s), s				7.7	0.0	0.0	26.4	14.5	0.0	0.0	46.4	0.0
Cycle Q Clear(g_c), s				7.7	0.0	0.0	26.4	14.5	0.0	0.0	46.4	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				418	226		558	2865	0	0	1741	
V/C Ratio(X)				0.67	0.00		0.99	0.53	0.00	0.00	0.98	
Avail Cap(c_a), veh/h				418	226		558	2865	0	0	1741	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.33	1.33
Upstream Filter(I)				1.00	0.00	0.00	0.09	0.09	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				42.1	0.0	0.0	31.3	3.5	0.0	0.0	17.0	0.0
Incr Delay (d2), s/veh				8.4	0.0	0.0	8.7	0.1	0.0	0.0	17.5	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.8	0.0	0.0	13.4	3.5	0.0	0.0	18.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				50.5	0.0	0.0	40.0	3.5	0.0	0.0	34.4	0.0
LnGrp LOS				D	A		D	A	A	A	C	
Approach Vol, veh/h					281	A		2057			1708	A
Approach Delay, s/veh					50.5			13.3			34.4	
Approach LOS					D			B			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	31.0	53.0		16.0		84.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	27.0	47.0		10.0		78.0						
Max Q Clear Time (g_c+I1), s	28.4	48.4		9.7		16.5						
Green Ext Time (p_c), s	0.0	0.0		0.1		5.8						
Intersection Summary												
HCM 6th Ctrl Delay				24.8								
HCM 6th LOS				C								
Notes												
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	550	0	160	0	0	0	0	1280	200	730	1040	0
Future Volume (vph)	550	0	160	0	0	0	0	1280	200	730	1040	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	410		155	0		0	0		280	0		0
Storage Lanes	2		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	3467	1881	1599	0	0	0	0	3574	1599	1787	3574	0
Flt Permitted	0.950									0.111		
Satd. Flow (perm)	3467	1881	1599	0	0	0	0	3574	1599	209	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			144						198			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	585	0	170	0	0	0	0	1362	213	777	1106	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	585	0	170	0	0	0	0	1362	213	777	1106	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			28			18	
Link Offset(ft)		0			0			6			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	24.0	24.0	24.0					38.0	38.0	38.0	76.0	
Total Split (%)	24.0%	24.0%	24.0%					38.0%	38.0%	38.0%	76.0%	
Maximum Green (s)	18.0	18.0	18.0					32.0	32.0	34.0	70.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Max	Max	Max					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	20.0		20.0					34.0	34.0	72.0	72.0	
Actuated g/C Ratio	0.20		0.20					0.34	0.34	0.72	0.72	
v/c Ratio	0.84		0.39					1.12	0.32	1.13	0.43	
Control Delay	51.2		11.5					98.0	5.7	90.9	0.2	
Queue Delay	3.2		0.0					0.0	0.0	0.1	0.2	
Total Delay	54.4		11.5					98.0	5.7	91.0	0.4	
LOS	D		B					F	A	F	A	
Approach Delay		44.7						85.6			37.8	
Approach LOS		D						F			D	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 7 (7%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 56.9

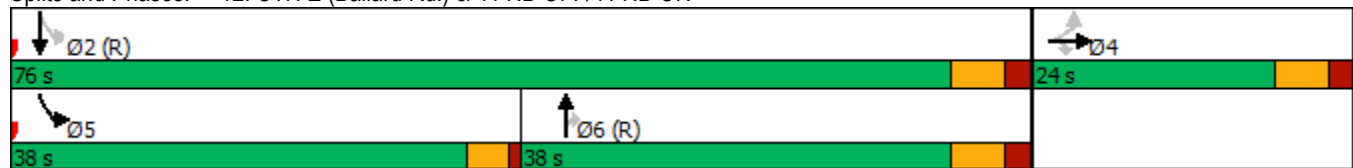
Intersection LOS: E

Intersection Capacity Utilization 101.8%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	550	0	160	0	0	0	0	1280	200	730	1040	0
Future Volume (veh/h)	550	0	160	0	0	0	0	1280	200	730	1040	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	585	0	0				0	1362	0	777	1106	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	697	377					0	1218		682	2579	0
Arrive On Green	0.20	0.00	0.00				0.00	0.68	0.00	0.23	0.48	0.00
Sat Flow, veh/h	3483	1885	1598				0	3676	1598	1795	3676	0
Grp Volume(v), veh/h	585	0	0				0	1362	0	777	1106	0
Grp Sat Flow(s),veh/h/ln	1742	1885	1598				0	1791	1598	1795	1791	0
Q Serve(g_s), s	16.1	0.0	0.0				0.0	34.0	0.0	34.0	20.2	0.0
Cycle Q Clear(g_c), s	16.1	0.0	0.0				0.0	34.0	0.0	34.0	20.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	697	377					0	1218		682	2579	0
V/C Ratio(X)	0.84	0.00					0.00	1.12		1.14	0.43	0.00
Avail Cap(c_a), veh/h	697	377					0	1218		682	2579	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	2.00	2.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.23	0.23	0.00
Uniform Delay (d), s/veh	38.5	0.0	0.0				0.0	16.0	0.0	33.4	12.5	0.0
Incr Delay (d2), s/veh	11.7	0.0	0.0				0.0	64.8	0.0	67.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.9	0.0	0.0				0.0	16.9	0.0	29.2	8.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.1	0.0	0.0				0.0	80.8	0.0	100.4	12.6	0.0
LnGrp LOS	D	A					A	F		F	B	A
Approach Vol, veh/h	585			A			1362			A		
Approach Delay, s/veh	50.1						80.8			48.8		
Approach LOS	D						F			D		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	76.0			24.0			38.0			38.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	70.0			18.0			34.0			32.0		
Max Q Clear Time (g_c+I1), s	22.2			18.1			36.0			36.0		
Green Ext Time (p_c), s	3.6			0.0			0.0			0.0		

Intersection Summary

HCM 6th Ctrl Delay	60.4
HCM 6th LOS	E

Notes

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (vph)	0	0	0	420	0	230	360	710	0	0	450	270
Future Volume (vph)	0	0	0	420	0	230	360	710	0	0	450	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3574	1599
Flt Permitted					0.950		0.357					
Satd. Flow (perm)	0	0	0	0	1787	1599	672	3574	0	0	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						145						238
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	500	0	274	429	845	0	0	536	321
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	500	274	429	845	0	0	536	321
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					26.3	26.3	44.7	44.7			24.9	24.9
Actuated g/C Ratio					0.33	0.33	0.57	0.57			0.31	0.31
v/c Ratio					0.84	0.44	0.71	0.42			0.48	0.48
Control Delay					41.7	13.6	24.9	10.2			24.0	9.3
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					41.7	13.6	24.9	10.2			24.0	9.3
LOS					D	B	C	B			C	A
Approach Delay					31.7			15.1			18.5	
Approach LOS					C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 79.1

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 20.5

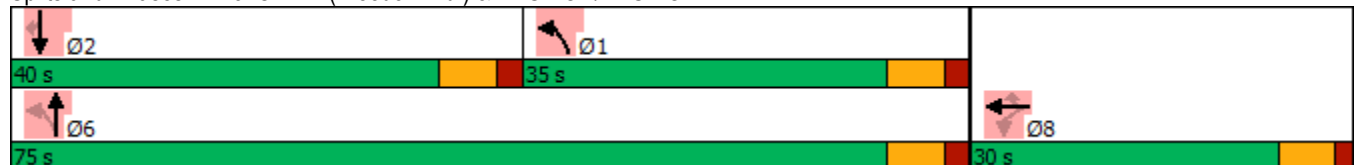
Intersection LOS: C

Intersection Capacity Utilization 69.9%

ICU Level of Service C

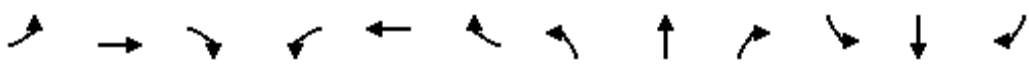
Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (veh/h)	0	0	0	420	0	230	360	710	0	0	450	270
Future Volume (veh/h)	0	0	0	420	0	230	360	710	0	0	450	270
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1885	1885
Adj Flow Rate, veh/h				500	0	0	429	845	0	0	536	0
Peak Hour Factor				0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %				1	1	1	1	1	0	0	1	1
Cap, veh/h				585	0		565	2019	0	0	1114	
Arrive On Green				0.33	0.00	0.00	0.20	0.56	0.00	0.00	0.31	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3676	1598
Grp Volume(v), veh/h				500	0	0	429	845	0	0	536	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1791	1598
Q Serve(g_s), s				18.8	0.0	0.0	7.0	9.7	0.0	0.0	8.8	0.0
Cycle Q Clear(g_c), s				18.8	0.0	0.0	7.0	9.7	0.0	0.0	8.8	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				585	0		565	2019	0	0	1114	
V/C Ratio(X)				0.85	0.00		0.76	0.42	0.00	0.00	0.48	
Avail Cap(c_a), veh/h				645	0		981	3516	0	0	1783	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				22.8	0.0	0.0	23.2	9.0	0.0	0.0	20.2	0.0
Incr Delay (d2), s/veh				10.1	0.0	0.0	3.0	0.1	0.0	0.0	0.5	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				9.0	0.0	0.0	6.6	3.3	0.0	0.0	3.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				32.9	0.0	0.0	26.2	9.2	0.0	0.0	20.6	0.0
LnGrp LOS				C	A		C	A	A	A	C	
Approach Vol, veh/h					500	A		1274			536	A
Approach Delay, s/veh					32.9			14.9			20.6	
Approach LOS					C			B			C	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	18.3	26.5				44.8		27.6				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	9.0	10.8				11.7		20.8				
Green Ext Time (p_c), s	2.7	3.7				4.7		0.7				

Intersection Summary

HCM 6th Ctrl Delay	20.1
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	560	0	370	0	0	0	0	510	160	190	680	0
Future Volume (vph)	560	0	370	0	0	0	0	510	160	190	680	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1752	1568	0	0	0	0	3438	1538	1752	3505	0
Flt Permitted		0.950								0.363		
Satd. Flow (perm)	0	1752	1568	0	0	0	0	3438	1538	670	3505	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			278						125			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	5%	5%	5%	3%	3%	3%
Adj. Flow (vph)	602	0	398	0	0	0	0	548	172	204	731	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	602	398	0	0	0	0	548	172	204	731	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

5:00 pm Baseline

Synchro 10 Report
Page 6

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	28.0	28.0	28.0					40.0	40.0	37.0	77.0	
Total Split (%)	26.7%	26.7%	26.7%					38.1%	38.1%	35.2%	73.3%	
Maximum Green (s)	22.0	22.0	22.0					33.5	33.5	30.5	70.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effct Green (s)		24.0	24.0					22.7	22.7	37.9	37.9	
Actuated g/C Ratio		0.34	0.34					0.32	0.32	0.54	0.54	
v/c Ratio		1.00	0.55					0.49	0.29	0.38	0.38	
Control Delay		63.2	9.3					20.9	7.8	13.7	9.9	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		63.2	9.3					20.9	7.8	13.7	9.9	
LOS		E	A					C	A	B	A	
Approach Delay		41.8						17.8			10.8	
Approach LOS		D						B			B	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 69.9

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 24.3

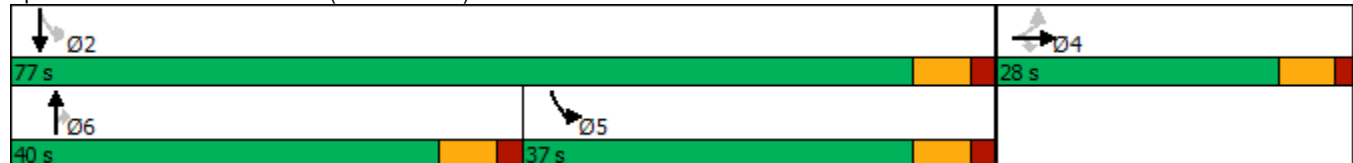
Intersection LOS: C

Intersection Capacity Utilization 69.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	560	0	370	0	0	0	0	510	160	190	680	0
Future Volume (veh/h)	560	0	370	0	0	0	0	510	160	190	680	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1826	1826	1856	1856	0
Adj Flow Rate, veh/h	602	0	0				0	548	0	204	731	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3				0	5	5	3	3	0
Cap, veh/h	615	0					0	1131		488	1890	0
Arrive On Green	0.35	0.00	0.00				0.00	0.33	0.00	0.15	0.54	0.00
Sat Flow, veh/h	1767	0	1572				0	3561	1547	1767	3618	0
Grp Volume(v), veh/h	602	0	0				0	548	0	204	731	0
Grp Sat Flow(s),veh/h/ln	1767	0	1572				0	1735	1547	1767	1763	0
Q Serve(g_s), s	23.2	0.0	0.0				0.0	8.7	0.0	0.0	8.4	0.0
Cycle Q Clear(g_c), s	23.2	0.0	0.0				0.0	8.7	0.0	0.0	8.4	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	615	0					0	1131		488	1890	0
V/C Ratio(X)	0.98	0.00					0.00	0.48		0.42	0.39	0.00
Avail Cap(c_a), veh/h	615	0					0	1810		1064	3730	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.3	0.0	0.0				0.0	18.6	0.0	22.2	9.4	0.0
Incr Delay (d2), s/veh	31.1	0.0	0.0				0.0	0.3	0.0	0.8	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	14.1	0.0	0.0				0.0	3.3	0.0	2.8	2.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.3	0.0	0.0				0.0	18.9	0.0	23.0	9.5	0.0
LnGrp LOS	D	A					A	B		C	A	A
Approach Vol, veh/h	602		A				548		A	935		
Approach Delay, s/veh	53.3						18.9			12.4		
Approach LOS	D						B			B		
Timer - Assigned Phs	2			4	5	6						
Phs Duration (G+Y+Rc), s	41.0			28.0	14.5	26.5						
Change Period (Y+Rc), s	6.5			6.0	6.5	6.5						
Max Green Setting (Gmax), s	70.5			22.0	30.5	33.5						
Max Q Clear Time (g_c+I1), s	10.4			25.2	2.0	10.7						
Green Ext Time (p_c), s	3.9			0.0	1.2	2.6						
Intersection Summary												
HCM 6th Ctrl Delay			26.0									
HCM 6th LOS			C									

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	320	0	240	120	320	0	0	190	70
Future Volume (vph)	0	0	0	320	0	240	120	320	0	0	190	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.942							0.850
Flt Protected					0.972		0.950					
Satd. Flow (prot)	0	0	0	0	1673	0	1787	1881	0	0	1845	1568
Flt Permitted					0.972		0.950					
Satd. Flow (perm)	0	0	0	0	1673	0	1787	1881	0	0	1845	1568
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1011			1061			775			328	
Travel Time (s)		23.0			24.1			17.6			7.5	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	1%	1%	1%	3%	3%	3%
Parking (#/hr)			0									
Adj. Flow (vph)	0	0	0	364	0	273	136	364	0	0	216	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	637	0	136	364	0	0	216	80
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	59.1%					ICU Level of Service B						
Analysis Period (min)	15											

Intersection

Int Delay, s/veh 160.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕		↕	↕			↕	↕
Traffic Vol, veh/h	0	0	0	320	0	240	120	320	0	0	190	70
Future Vol, veh/h	0	0	0	320	0	240	120	320	0	0	190	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	4	4	4	1	1	1	3	3	3
Mvmt Flow	0	0	0	364	0	273	136	364	0	0	216	80

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	892	932	364
Stage 1	636	636	-
Stage 2	256	296	-
Critical Hdwy	6.44	6.54	6.24
Critical Hdwy Stg 1	5.44	5.54	-
Critical Hdwy Stg 2	5.44	5.54	-
Follow-up Hdwy	3.536	4.036	3.336
Pot Cap-1 Maneuver	~ 310	264	676
Stage 1	524	469	-
Stage 2	782	665	-
Platoon blocked, %			-
Mov Cap-1 Maneuver	~ 277	0	676
Mov Cap-2 Maneuver	~ 277	0	-
Stage 1	468	0	-
Stage 2	782	0	-

Approach	WB	NB	SB
HCM Control Delay, s	\$ 358.4	2.2	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBTWBLn1	SBT	SBR
Capacity (veh/h)	1271	-	371	-
HCM Lane V/C Ratio	0.107	-	1.715	-
HCM Control Delay (s)	8.2	-	\$ 358.4	-
HCM Lane LOS	A	-	F	-
HCM 95th %tile Q(veh)	0.4	-	39.2	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	0	90	0	0	0	0	300	200	110	400	0
Future Volume (vph)	140	0	90	0	0	0	0	300	200	110	400	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.947							0.850			
Flt Protected		0.970								0.950		
Satd. Flow (prot)	0	1728	0	0	0	0	0	1845	1568	1787	1881	0
Flt Permitted		0.970								0.950		
Satd. Flow (perm)	0	1728	0	0	0	0	0	1845	1568	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	3%	3%	3%	1%	1%	1%
Adj. Flow (vph)	163	0	105	0	0	0	0	349	233	128	465	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	268	0	0	0	0	0	349	233	128	465	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	59.1%						ICU Level of Service B					
Analysis Period (min)	15											

Intersection

Int Delay, s/veh 23

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↑	↗	↘	↑	
Traffic Vol, veh/h	140	0	90	0	0	0	0	300	200	110	400	0
Future Vol, veh/h	140	0	90	0	0	0	0	300	200	110	400	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	4	4	4	3	3	3	1	1	1
Mvmt Flow	163	0	105	0	0	0	0	349	233	128	465	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	1187	1303	465	-	0	0	582	0	0
Stage 1	721	721	-	-	-	-	-	-	-
Stage 2	466	582	-	-	-	-	-	-	-
Critical Hdwy	6.41	6.51	6.21	-	-	-	4.11	-	-
Critical Hdwy Stg 1	5.41	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.41	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	-	-	-	2.209	-	-
Pot Cap-1 Maneuver	209	161	599	0	-	-	997	-	0
Stage 1	483	433	-	0	-	-	-	-	0
Stage 2	634	501	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	182	0	599	-	-	-	997	-	-
Mov Cap-2 Maneuver	182	0	-	-	-	-	-	-	-
Stage 1	421	0	-	-	-	-	-	-	-
Stage 2	634	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	119.8	0	2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	250	997	-
HCM Lane V/C Ratio	-	-	1.07	0.128	-
HCM Control Delay (s)	-	-	119.8	9.1	-
HCM Lane LOS	-	-	F	A	-
HCM 95th %tile Q(veh)	-	-	11.2	0.4	-

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	240	90	200	200	0	0	0	0	150	0	300
Future Volume (vph)	0	240	90	200	200	0	0	0	0	150	0	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		100
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850										0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	282	106	235	235	0	0	0	0	176	0	353
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	282	106	235	235	0	0	0	0	0	176	353
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	15											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Vol, veh/h	0	240	90	200	200	0	0	0	0	150	0	300
Future Vol, veh/h	0	240	90	200	200	0	0	0	0	150	0	300
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	250	-	-	-	-	-	-	-	100
Veh in Median Storage, #	-	0	-	-	0	-	-	16974	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	2	2	2
Mvmt Flow	0	282	106	235	235	0	0	0	0	176	0	353
Major/Minor	Major1			Major2			Minor2					
Conflicting Flow All	-	0	0	388	0	0				1040	1093	235
Stage 1	-	-	-	-	-	-				705	705	-
Stage 2	-	-	-	-	-	-				335	388	-
Critical Hdwy	-	-	-	4.11	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	-	-	-	2.209	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	0	-	-	1176	-	0				255	214	804
Stage 1	0	-	-	-	-	0				490	439	-
Stage 2	0	-	-	-	-	0				725	609	-
Platoon blocked, %		-	-		-							
Mov Cap-1 Maneuver	-	-	-	1176	-	-				204	0	804
Mov Cap-2 Maneuver	-	-	-	-	-	-				204	0	-
Stage 1	-	-	-	-	-	-				392	0	-
Stage 2	-	-	-	-	-	-				725	0	-
Approach	EB			WB			SB					
HCM Control Delay, s	0			4.4			35.5					
HCM LOS	E											
Minor Lane/Major Mvmt	EBT	EBR	WBL	WBT	SBLn1	SBLn2						
Capacity (veh/h)	-	-	1176	-	204	804						
HCM Lane V/C Ratio	-	-	0.2	-	0.865	0.439						
HCM Control Delay (s)	-	-	8.8	-	80.6	12.9						
HCM Lane LOS	-	-	A	-	F	B						
HCM 95th %tile Q(veh)	-	-	0.7	-	6.6	2.3						

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	230	0	0	330	240	70	0	200	0	0	0
Future Volume (vph)	160	230	0	0	330	240	70	0	200	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		100	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	182	261	0	0	375	273	80	0	227	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	182	261	0	0	375	273	0	80	227	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	42.0%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 6th TWSC
22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

Intersection												
Int Delay, s/veh	5.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	160	230	0	0	330	240	70	0	200	0	0	0
Future Vol, veh/h	160	230	0	0	330	240	70	0	200	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	325	-	-	-	-	300	-	-	100	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	2	2	2	5	5	5	5	5	5
Mvmt Flow	182	261	0	0	375	273	80	0	227	0	0	0

Major/Minor	Major1		Major2		Minor1		
Conflicting Flow All	648	0	-	-	-	0	1137 1273 261
Stage 1	-	-	-	-	-	-	625 625 -
Stage 2	-	-	-	-	-	-	512 648 -
Critical Hdwy	4.11	-	-	-	-	-	6.45 6.55 6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	5.45 5.55 -
Critical Hdwy Stg 2	-	-	-	-	-	-	5.45 5.55 -
Follow-up Hdwy	2.209	-	-	-	-	-	3.545 4.045 3.345
Pot Cap-1 Maneuver	943	-	0	0	-	-	220 165 770
Stage 1	-	-	0	0	-	-	528 473 -
Stage 2	-	-	0	0	-	-	596 461 -
Platoon blocked, %	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	943	-	-	-	-	-	178 0 770
Mov Cap-2 Maneuver	-	-	-	-	-	-	178 0 -
Stage 1	-	-	-	-	-	-	426 0 -
Stage 2	-	-	-	-	-	-	596 0 -

Approach	EB	WB	NB
HCM Control Delay, s	4	0	19.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	WBT	WBR
Capacity (veh/h)	178	770	943	-	-	-
HCM Lane V/C Ratio	0.447	0.295	0.193	-	-	-
HCM Control Delay (s)	40.6	11.6	9.7	-	-	-
HCM Lane LOS	E	B	A	-	-	-
HCM 95th %tile Q(veh)	2.1	1.2	0.7	-	-	-

APPENDIX O11

Year 2028 Build with Short Term Improvements

Synchro AM Peak Hour

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑↑						↑	↑↑
Traffic Volume (vph)	0	650	210	380	650	0	0	0	0	160	0	290
Future Volume (vph)	0	650	210	380	650	0	0	0	0	160	0	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	5085	0	0	0	0	0	1770	2787
Flt Permitted				0.181							0.950	
Satd. Flow (perm)	0	5085	1583	337	5085	0	0	0	0	0	1770	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			269									372
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	833	269	487	833	0	0	0	0	205	0	372
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	833	269	487	833	0	0	0	0	0	205	372
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	73.7	73.7						18.3	18.3
Actuated g/C Ratio		0.30	0.30	0.74	0.74						0.18	0.18
v/c Ratio		0.55	0.41	0.60	0.22						0.63	0.46
Control Delay		30.9	5.4	8.5	0.3						46.3	5.4
Queue Delay		0.0	0.0	1.2	0.2						0.0	0.0
Total Delay		31.0	5.4	9.7	0.5						46.3	5.4
LOS		C	A	A	A						D	A
Approach Delay		24.7			3.9						20.0	
Approach LOS		C			A						B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 14.6

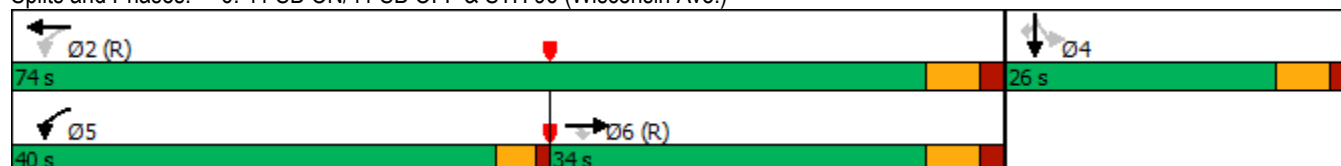
Intersection LOS: B

Intersection Capacity Utilization 48.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑↑						↑	↑↑
Traffic Volume (veh/h)	0	650	210	380	650	0	0	0	0	160	0	290
Future Volume (veh/h)	0	650	210	380	650	0	0	0	0	160	0	290
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	833	0	487	833	0				205	0	372
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1736		839	3778	0				321	0	502
Arrive On Green	0.00	0.34	0.00	0.72	1.00	0.00				0.18	0.00	0.18
Sat Flow, veh/h	0	5274	1585	1781	5274	0				1781	0	2790
Grp Volume(v), veh/h	0	833	0	487	833	0				205	0	372
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1702	0				1781	0	1395
Q Serve(g_s), s	0.0	12.9	0.0	7.9	0.0	0.0				10.7	0.0	12.6
Cycle Q Clear(g_c), s	0.0	12.9	0.0	7.9	0.0	0.0				10.7	0.0	12.6
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1736		839	3778	0				321	0	502
V/C Ratio(X)	0.00	0.48		0.58	0.22	0.00				0.64	0.00	0.74
Avail Cap(c_a), veh/h	0	1736		839	3778	0				392	0	614
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.75	0.75	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	26.0	0.0	3.2	0.0	0.0				38.0	0.0	38.8
Incr Delay (d2), s/veh	0.0	1.0	0.0	2.2	0.1	0.0				2.5	0.0	3.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.3	0.0	1.8	0.0	0.0				4.8	0.0	9.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	27.0	0.0	5.4	0.1	0.0				40.5	0.0	42.6
LnGrp LOS	A	C		A	A	A				D	A	D
Approach Vol, veh/h		833	A		1320						577	
Approach Delay, s/veh		27.0			2.1						41.8	
Approach LOS		C			A						D	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		78.0		22.0	40.0	38.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		2.0		14.6	9.9	14.9						
Green Ext Time (p_c), s		7.4		1.4	1.2	4.8						
Intersection Summary												
HCM 6th Ctrl Delay			18.1									
HCM 6th LOS			B									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (vph)	170	640	0	0	740	70	290	0	380	0	0	0
Future Volume (vph)	170	640	0	0	740	70	290	0	380	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.86	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Flt Permitted	0.176						0.950					
Satd. Flow (perm)	328	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						86			441			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	210	790	0	0	914	86	358	0	469	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	210	790	0	0	914	86	358	0	469	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	0.28	0.32			0.48	0.16	0.97		0.49			
Control Delay	1.4	2.9			29.6	6.6	80.2		6.2			
Queue Delay	0.0	0.7			0.0	0.0	0.0		0.0			
Total Delay	1.4	3.6			29.6	6.6	80.2		6.2			
LOS	A	A			C	A	F		A			
Approach Delay		3.2			27.6			38.2				
Approach LOS		A			C			D				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 22.1

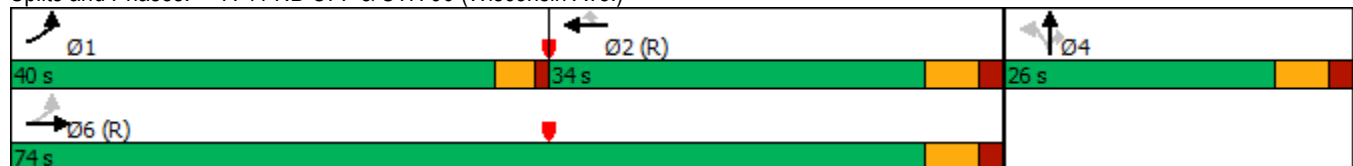
Intersection LOS: C

Intersection Capacity Utilization 48.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			   				  			
Traffic Volume (veh/h)	170	640	0	0	740	70	290	0	380	0	0	0
Future Volume (veh/h)	170	640	0	0	740	70	290	0	380	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	210	790	0	0	914	86	358	0	0			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	854	2750	0	0	2406	593	521	0				
Arrive On Green	0.24	0.52	0.00	0.00	0.37	0.37	0.15	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	6696	1585	3563	0	3170			
Grp Volume(v), veh/h	210	790	0	0	914	86	358	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1609	1585	1781	0	1585			
Q Serve(g_s), s	4.0	12.6	0.0	0.0	10.4	3.6	9.5	0.0	0.0			
Cycle Q Clear(g_c), s	4.0	12.6	0.0	0.0	10.4	3.6	9.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	854	2750	0	0	2406	593	521	0				
V/C Ratio(X)	0.25	0.29	0.00	0.00	0.38	0.15	0.69	0.00				
Avail Cap(c_a), veh/h	854	2750	0	0	2406	593	784	0				
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.82	0.82	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	6.5	8.5	0.0	0.0	22.8	20.7	40.5	0.0	0.0			
Incr Delay (d2), s/veh	0.6	0.2	0.0	0.0	0.5	0.5	1.6	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.4	5.4	0.0	0.0	3.9	1.4	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.0	8.7	0.0	0.0	23.3	21.2	42.2	0.0	0.0			
LnGrp LOS	A	A	A	A	C	C	D	A				
Approach Vol, veh/h	1000			1000			358			A		
Approach Delay, s/veh	8.3			23.1			42.2					
Approach LOS	A			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	41.4		18.6		81.4						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	6.0	12.4		11.5		14.6						
Green Ext Time (p_c), s	0.5	6.4		1.1		6.9						

Intersection Summary

HCM 6th Ctrl Delay 19.7

HCM 6th LOS B

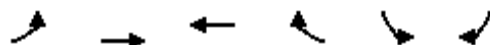
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/21/2019

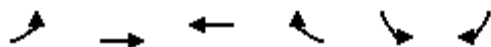


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	200	1240	650	380	190	810
Future Volume (vph)	200	1240	650	380	190	810
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			0	0	375
Storage Lanes	1			1	1	2
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	0.88
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1763	3539	3505	1568	1770	2787
Flt Permitted	0.206				0.950	
Satd. Flow (perm)	382	3539	3505	1568	1770	2787
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				500		692
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	263	1632	855	500	250	1066
Shared Lane Traffic (%)						
Lane Group Flow (vph)	263	1632	855	500	250	1066
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		24	24		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0

Lanes, Volumes, Timings

8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	16.0
Total Split (s)	22.0	62.0	40.0	40.0	38.0	38.0
Total Split (%)	22.0%	62.0%	40.0%	40.0%	38.0%	38.0%
Maximum Green (s)	17.0	56.0	34.0	34.0	32.0	32.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effct Green (s)	62.9	62.9	45.2	45.2	29.1	29.1
Actuated g/C Ratio	0.63	0.63	0.45	0.45	0.29	0.29
v/c Ratio	0.61	0.73	0.54	0.51	0.49	0.82
Control Delay	15.9	16.5	23.4	4.1	31.6	16.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.9	16.5	23.4	4.1	31.6	16.3
LOS	B	B	C	A	C	B
Approach Delay		16.4	16.3		19.2	
Approach LOS		B	B		B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 17.2

Intersection LOS: B

Intersection Capacity Utilization 53.0%

ICU Level of Service A

Analysis Period (min) 15

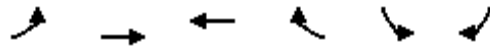
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	200	1240	650	380	190	810
Future Volume (veh/h)	200	1240	650	380	190	810
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	263	1632	855	0	250	1066
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	425	2061	1503		606	948
Arrive On Green	0.11	0.58	0.43	0.00	0.34	0.34
Sat Flow, veh/h	1781	3647	3618	1572	1781	2790
Grp Volume(v), veh/h	263	1632	855	0	250	1066
Grp Sat Flow(s),veh/h/ln	1781	1777	1763	1572	1781	1395
Q Serve(g_s), s	7.8	35.7	18.4	0.0	10.8	34.0
Cycle Q Clear(g_c), s	7.8	35.7	18.4	0.0	10.8	34.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	425	2061	1503		606	948
V/C Ratio(X)	0.62	0.79	0.57		0.41	1.12
Avail Cap(c_a), veh/h	543	2061	1503		606	948
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.78	0.00	1.00	1.00
Uniform Delay (d), s/veh	15.4	16.3	21.7	0.0	25.3	33.0
Incr Delay (d2), s/veh	1.5	3.2	1.2	0.0	0.6	69.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.1	14.2	7.6	0.0	4.6	20.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.9	19.5	23.0	0.0	26.0	102.5
LnGrp LOS	B	B	C		C	F
Approach Vol, veh/h		1895	855	A	1316	
Approach Delay, s/veh		19.2	23.0		88.0	
Approach LOS		B	C		F	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	15.4	46.6		38.0		62.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	17.0	34.0		32.0		56.0
Max Q Clear Time (g_c+I1), s	9.8	20.4		36.0		37.7
Green Ext Time (p_c), s	0.6	3.7		0.0		12.1

Intersection Summary

HCM 6th Ctrl Delay	42.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕			↕↕↕	↕	↕	↕	↕			
Traffic Volume (vph)	600	830	0	0	840	150	190	0	440	0	0	0
Future Volume (vph)	600	830	0	0	840	150	190	0	440	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	200		670	0		0
Storage Lanes	2		0	0		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	3467	3574	0	0	5085	1583	1671	1588	1495	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	3467	3574	0	0	5085	1583	1671	1588	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						197			361			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	789	1092	0	0	1105	197	250	0	579	0	0	0
Shared Lane Traffic (%)							100%					
Lane Group Flow (vph)	789	1092	0	0	1105	197	0	250	579	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Split	NA	Free			
Protected Phases	1	6			2		4	4				
Permitted Phases						2			Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				
Minimum Split (s)	12.0	26.0			30.0	30.0	20.0	20.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	34.0	67.0			33.0	33.0	23.0	23.0				
Total Split (%)	37.8%	74.4%			36.7%	36.7%	25.6%	25.6%				
Maximum Green (s)	29.0	61.0			27.0	27.0	17.0	17.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0	-2.0	-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	None	Min			C-Min	C-Min	None	None				
Act Effct Green (s)	26.7	63.6			33.0	33.0		18.4	90.0			
Actuated g/C Ratio	0.30	0.71			0.37	0.37		0.20	1.00			
v/c Ratio	0.77	0.43			0.59	0.28		0.77	0.39			
Control Delay	34.1	6.3			25.5	4.6		51.0	0.8			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	34.1	6.3			25.5	4.6		51.0	0.8			
LOS	C	A			C	A		D	A			
Approach Delay		18.0			22.4			15.9				
Approach LOS		B			C			B				

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 19.0

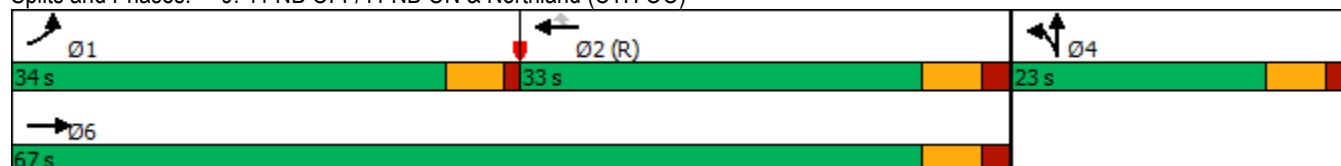
Intersection LOS: B

Intersection Capacity Utilization 52.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (veh/h)	600	830	0	0	840	150	190	0	440	0	0	0
Future Volume (veh/h)	600	830	0	0	840	150	190	0	440	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781			
Adj Flow Rate, veh/h	789	1092	0	0	1105	0	250	0	0			
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76			
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8			
Cap, veh/h	955	2787	0	0	2345		452	0				
Arrive On Green	0.27	0.78	0.00	0.00	0.46	0.00	0.13	0.00	0.00			
Sat Flow, veh/h	3483	3676	0	0	5274	1585	3393	0	1510			
Grp Volume(v), veh/h	789	1092	0	0	1105	0	250	0	0			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1702	1585	1697	0	1510			
Q Serve(g_s), s	19.1	8.8	0.0	0.0	13.4	0.0	6.2	0.0	0.0			
Cycle Q Clear(g_c), s	19.1	8.8	0.0	0.0	13.4	0.0	6.2	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	955	2787	0	0	2345		452	0				
V/C Ratio(X)	0.83	0.39	0.00	0.00	0.47		0.55	0.00				
Avail Cap(c_a), veh/h	1161	2787	0	0	2345		716	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.65	0.65	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	30.6	3.2	0.0	0.0	16.8	0.0	36.5	0.0	0.0			
Incr Delay (d2), s/veh	2.8	0.1	0.0	0.0	0.7	0.0	1.5	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	8.2	2.1	0.0	0.0	5.1	0.0	2.6	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.4	3.2	0.0	0.0	17.5	0.0	38.0	0.0	0.0			
LnGrp LOS	C	A	A	A	B		D	A				
Approach Vol, veh/h	1881			1105			A			250		
Approach Delay, s/veh	15.9			17.5			38.0			A		
Approach LOS	B			B			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	28.7	45.3		16.0		74.0						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	29.0	27.0		17.0		61.0						
Max Q Clear Time (g_c+I1), s	21.1	15.4		8.2		10.8						
Green Ext Time (p_c), s	2.6	5.9		1.0		6.7						

Intersection Summary

HCM 6th Ctrl Delay	18.2
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

08/21/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	580	0	1000	0	0
Future Volume (vph)	0	580	0	1000	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865					
Flt Protected						
Satd. Flow (prot)	0	1611	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1611	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	630	0	1087	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	630	0	1087	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	56.0%			ICU Level of Service B		
Analysis Period (min)	15					

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	660	160	1030	0	0	870	550
Future Volume (vph)	0	0	0	230	0	660	160	1030	0	0	870	550
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		300	0		0	450		410
Storage Lanes	0		0	1		2	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1681	1681	2787	1787	3574	0	0	5085	1583
Flt Permitted				0.950	0.950		0.132					
Satd. Flow (perm)	0	0	0	1681	1681	2787	248	3574	0	0	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						158						663
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	277	0	795	193	1241	0	0	1048	663
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	138	139	795	193	1241	0	0	1048	663
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			18			16	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-1.0	-1.0	-1.0	-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)				5.0	5.0	5.0	2.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Min	Min	Min	Max	C-Min			C-Min	C-Min
Act Effct Green (s)				25.5	25.5	25.5	67.5	65.5			31.5	31.5
Actuated g/C Ratio				0.26	0.26	0.26	0.68	0.66			0.32	0.32
v/c Ratio				0.32	0.32	0.96	0.29	0.53			0.65	0.70
Control Delay				33.1	33.1	53.5	4.3	4.6			31.8	6.6
Queue Delay				0.1	0.1	0.0	0.0	0.9			0.0	0.0
Total Delay				33.2	33.2	53.5	4.3	5.5			31.8	6.6
LOS				C	C	D	A	A			C	A
Approach Delay					48.3			5.3			22.0	
Approach LOS					D			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 23.0

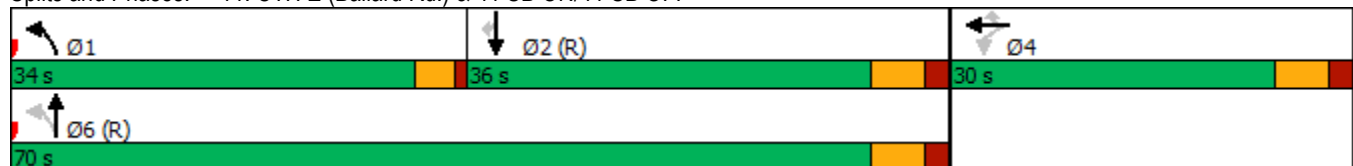
Intersection LOS: C

Intersection Capacity Utilization 84.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↱	↰↱	↰	↱			↰↱↰↱	↰
Traffic Volume (veh/h)	0	0	0	230	0	660	160	1030	0	0	870	550
Future Volume (veh/h)	0	0	0	230	0	660	160	1030	0	0	870	550
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				277	0	795	193	1241	0	0	1048	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				891	0	793	725	2364	0	0	1634	
Arrive On Green				0.25	0.00	0.25	0.11	0.22	0.00	0.00	0.32	0.00
Sat Flow, veh/h				3563	0	3170	1795	3676	0	0	5274	1585
Grp Volume(v), veh/h				277	0	795	193	1241	0	0	1048	0
Grp Sat Flow(s),veh/h/ln				1781	0	1585	1795	1791	0	0	1702	1585
Q Serve(g_s), s				6.3	0.0	25.0	5.0	30.6	0.0	0.0	17.6	0.0
Cycle Q Clear(g_c), s				6.3	0.0	25.0	5.0	30.6	0.0	0.0	17.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				891	0	793	725	2364	0	0	1634	
V/C Ratio(X)				0.31	0.00	1.00	0.27	0.52	0.00	0.00	0.64	
Avail Cap(c_a), veh/h				891	0	793	725	2364	0	0	1634	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.70	0.70	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				30.5	0.0	37.5	13.4	25.3	0.0	0.0	29.1	0.0
Incr Delay (d2), s/veh				0.3	0.0	32.7	0.6	0.6	0.0	0.0	1.9	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.7	0.0	13.1	2.0	14.7	0.0	0.0	7.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				30.8	0.0	70.2	14.0	25.9	0.0	0.0	31.0	0.0
LnGrp LOS				C	A	F	B	C	A	A	C	
Approach Vol, veh/h					1072			1434			1048	A
Approach Delay, s/veh					60.0			24.3			31.0	
Approach LOS					E			C			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	36.0		30.0		70.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	7.0	19.6		27.0		32.6						
Green Ext Time (p_c), s	0.4	5.3		0.0		4.2						

Intersection Summary

HCM 6th Ctrl Delay 37.0

HCM 6th LOS D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	540	0	350	0	0	0	0	650	270	810	290	0
Future Volume (vph)	540	0	350	0	0	0	0	650	270	810	290	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		300	0		0	200		280	0		0
Storage Lanes	1		2	0		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.88	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.95	1.00
Frt			0.850							0.850		
Flt Protected	0.950	0.950								0.950		
Satd. Flow (prot)	1681	1681	2787	0	0	0	0	5136	1599	1787	3574	0
Flt Permitted	0.950	0.950								0.211		
Satd. Flow (perm)	1681	1681	2787	0	0	0	0	5136	1599	397	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			398						307			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	614	0	398	0	0	0	0	739	307	920	330	0
Shared Lane Traffic (%)	50%											
Lane Group Flow (vph)	307	307	398	0	0	0	0	739	307	920	330	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			16			18	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	25.0	25.0	25.0					31.0	31.0	44.0	75.0	
Total Split (%)	25.0%	25.0%	25.0%					31.0%	31.0%	44.0%	75.0%	
Maximum Green (s)	19.0	19.0	19.0					25.0	25.0	40.0	69.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0					-2.0	-2.0	-2.0	-2.0	
Total Lost Time (s)	5.0	5.0	5.0					4.0	4.0	2.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Min	C-Min	Max	C-Min	
Act Effect Green (s)	21.0	21.0	21.0					25.2	25.2	72.0	70.0	
Actuated g/C Ratio	0.21	0.21	0.21					0.25	0.25	0.72	0.70	
v/c Ratio	0.87	0.87	0.44					0.57	0.49	1.05	0.13	
Control Delay	63.9	63.9	5.2					34.4	6.3	59.6	0.1	
Queue Delay	0.0	0.0	0.0					0.0	0.0	18.2	0.0	
Total Delay	63.9	63.9	5.2					34.4	6.3	77.8	0.1	
LOS	E	E	A					C	A	E	A	
Approach Delay		40.9						26.1			57.3	
Approach LOS		D						C			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 4 (4%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 42.4

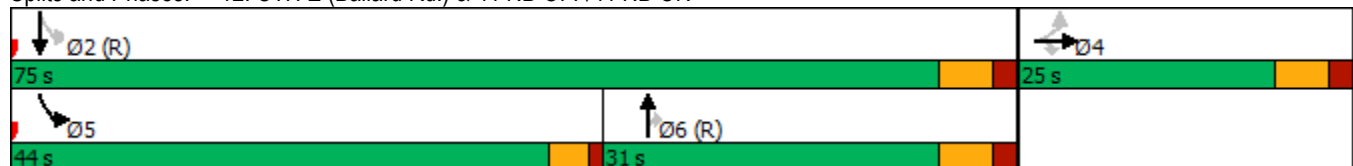
Intersection LOS: D

Intersection Capacity Utilization 84.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	540	0	350	0	0	0	0	650	270	810	290	0
Future Volume (veh/h)	540	0	350	0	0	0	0	650	270	810	290	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	614	0	398				0	739	0	920	330	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	709	0	631				0	1395		934	2547	0
Arrive On Green	0.20	0.00	0.20				0.00	0.27	0.00	0.42	0.71	0.00
Sat Flow, veh/h	3563	0	3170				0	5316	1598	1795	3676	0
Grp Volume(v), veh/h	614	0	398				0	739	0	920	330	0
Grp Sat Flow(s),veh/h/ln	1781	0	1585				0	1716	1598	1795	1791	0
Q Serve(g_s), s	16.7	0.0	11.5				0.0	12.2	0.0	40.4	2.9	0.0
Cycle Q Clear(g_c), s	16.7	0.0	11.5				0.0	12.2	0.0	40.4	2.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	709	0	631				0	1395		934	2547	0
V/C Ratio(X)	0.87	0.00	0.63				0.00	0.53		0.99	0.13	0.00
Avail Cap(c_a), veh/h	713	0	634				0	1395		934	2547	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	0.00	0.75	0.75	0.00
Uniform Delay (d), s/veh	38.8	0.0	36.7				0.0	31.0	0.0	18.1	4.6	0.0
Incr Delay (d2), s/veh	11.2	0.0	2.3				0.0	1.4	0.0	22.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.3	0.0	10.2				0.0	5.2	0.0	20.4	1.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.0	0.0	39.0				0.0	32.5	0.0	40.2	4.7	0.0
LnGrp LOS	D	A	D				A	C		D	A	A
Approach Vol, veh/h	1012						739			A		
Approach Delay, s/veh	45.7						32.5			30.8		
Approach LOS	D						C			C		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	75.1			24.9			44.0			31.1		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	69.0			19.0			40.0			25.0		
Max Q Clear Time (g_c+l1), s	4.9			18.7			42.4			14.2		
Green Ext Time (p_c), s	0.9			0.2			0.0			3.8		
Intersection Summary												
HCM 6th Ctrl Delay	36.2											
HCM 6th LOS	D											
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.												

APPENDIX O12

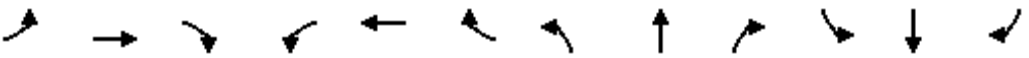
Year 2028 Build with Short Term Improvements

Synchro PM Peak Hour

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑↑						↑	↑↑
Traffic Volume (vph)	0	1580	420	600	1620	0	0	0	0	220	0	500
Future Volume (vph)	0	1580	420	600	1620	0	0	0	0	220	0	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	5085	0	0	0	0	0	1787	2814
Flt Permitted				0.118							0.950	
Satd. Flow (perm)	0	5085	1583	220	5085	0	0	0	0	0	1787	2814
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			429									92
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1612	429	612	1653	0	0	0	0	224	0	510
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1612	429	612	1653	0	0	0	0	0	224	510
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	37.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		32.0	32.0	73.4	73.4						18.6	18.6
Actuated g/C Ratio		0.32	0.32	0.73	0.73						0.19	0.19
v/c Ratio		0.99	0.54	0.83	0.44						0.67	0.85
Control Delay		54.8	5.3	5.7	0.6						49.0	47.1
Queue Delay		0.0	0.0	50.8	20.8						0.1	0.0
Total Delay		54.8	5.3	56.5	21.4						49.1	47.1
LOS		D	A	E	C						D	D
Approach Delay		44.4			30.9						47.7	
Approach LOS		D			C						D	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 38.8

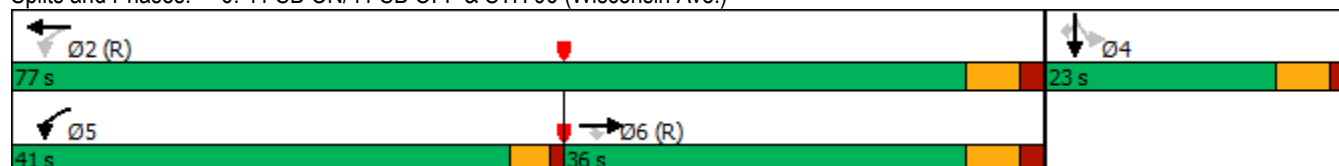
Intersection LOS: D

Intersection Capacity Utilization 88.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↗	↑↑↑						↖	↖↗
Traffic Volume (veh/h)	0	1580	420	600	1620	0	0	0	0	220	0	500
Future Volume (veh/h)	0	1580	420	600	1620	0	0	0	0	220	0	500
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1612	0	612	1653	0				224	0	510
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1634		731	3727	0				341	0	534
Arrive On Green	0.00	0.32	0.00	0.74	1.00	0.00				0.19	0.00	0.19
Sat Flow, veh/h	0	5274	1585	1781	5274	0				1795	0	2812
Grp Volume(v), veh/h	0	1612	0	612	1653	0				224	0	510
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1702	0				1795	0	1406
Q Serve(g_s), s	0.0	31.4	0.0	15.6	0.0	0.0				11.5	0.0	17.9
Cycle Q Clear(g_c), s	0.0	31.4	0.0	15.6	0.0	0.0				11.5	0.0	17.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1634		731	3727	0				341	0	534
V/C Ratio(X)	0.00	0.99		0.84	0.44	0.00				0.66	0.00	0.95
Avail Cap(c_a), veh/h	0	1634		731	3727	0				341	0	534
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	33.8	0.0	5.7	0.0	0.0				37.5	0.0	40.1
Incr Delay (d2), s/veh	0.0	19.3	0.0	1.1	0.0	0.0				4.5	0.0	27.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	15.5	0.0	1.9	0.0	0.0				5.4	0.0	14.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	53.1	0.0	6.8	0.0	0.0				42.0	0.0	67.9
LnGrp LOS	A	D		A	A	A				D	A	E
Approach Vol, veh/h		1612	A		2265						734	
Approach Delay, s/veh		53.1			1.9						60.0	
Approach LOS		D			A						E	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		77.0		23.0	41.0	36.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		71.0		17.0	37.0	30.0						
Max Q Clear Time (g_c+I1), s		2.0		19.9	17.6	33.4						
Green Ext Time (p_c), s		22.1		0.0	1.6	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			29.0									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (vph)	730	1070	0	0	1800	310	420	0	490	0	0	0
Future Volume (vph)	730	1070	0	0	1800	310	420	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.86	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Flt Permitted	0.138						0.950					
Satd. Flow (perm)	257	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						316			261			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	745	1092	0	0	1837	316	429	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	745	1092	0	0	1837	316	429	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	45.0	76.0			31.0	31.0	24.0	24.0	24.0			
Total Split (%)	45.0%	76.0%			31.0%	31.0%	24.0%	24.0%	24.0%			
Maximum Green (s)	41.0	70.0			25.0	25.0	18.0	18.0	18.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	72.0	72.0			27.0	27.0	20.0		20.0			
Actuated g/C Ratio	0.72	0.72			0.27	0.27	0.20		0.20			
v/c Ratio	0.93	0.43			1.06	0.48	1.28		0.65			
Control Delay	14.3	0.3			76.2	6.1	180.7		21.7			
Queue Delay	45.7	1.7			0.0	0.0	0.0		0.0			
Total Delay	60.0	2.0			76.2	6.1	180.7		21.7			
LOS	E	A			E	A	F		C			
Approach Delay	25.5				65.9				95.1			
Approach LOS	C				E				F			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.28

Intersection Signal Delay: 56.3

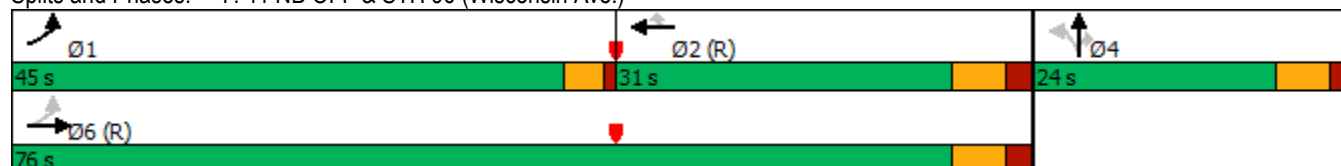
Intersection LOS: E

Intersection Capacity Utilization 88.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



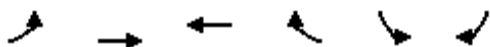
HCM 6th Signalized Intersection Summary
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (veh/h)	730	1070	0	0	1800	310	420	0	490	0	0	0
Future Volume (veh/h)	730	1070	0	0	1800	310	420	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	745	1092	0	0	1837	316	429	0	0			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	804	2689	0	0	1974	486	581	0				
Arrive On Green	0.14	0.25	0.00	0.00	0.31	0.31	0.16	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	6696	1585	3563	0	3170			
Grp Volume(v), veh/h	745	1092	0	0	1837	316	429	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1609	1585	1781	0	1585			
Q Serve(g_s), s	37.1	25.7	0.0	0.0	27.7	17.3	11.5	0.0	0.0			
Cycle Q Clear(g_c), s	37.1	25.7	0.0	0.0	27.7	17.3	11.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	804	2689	0	0	1974	486	581	0				
V/C Ratio(X)	0.93	0.41	0.00	0.00	0.93	0.65	0.74	0.00				
Avail Cap(c_a), veh/h	804	2689	0	0	1974	486	713	0				
HCM Platoon Ratio	0.33	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.11	0.11	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	36.9	18.7	0.0	0.0	33.6	30.0	39.8	0.0	0.0			
Incr Delay (d2), s/veh	2.9	0.1	0.0	0.0	9.4	6.6	3.2	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	20.2	12.1	0.0	0.0	11.8	7.4	5.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.8	18.8	0.0	0.0	43.0	36.6	43.0	0.0	0.0			
LnGrp LOS	D	B	A	A	D	D	D	A				
Approach Vol, veh/h	1837			2153			429			A		
Approach Delay, s/veh	27.3			42.1			43.0					
Approach LOS	C			D			D					
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	45.0	34.7	20.3		79.7							
Change Period (Y+Rc), s	4.0	6.0	6.0		6.0							
Max Green Setting (Gmax), s	41.0	25.0	18.0		70.0							
Max Q Clear Time (g_c+I1), s	39.1	29.7	13.5		27.7							
Green Ext Time (p_c), s	0.5	0.0	0.9		10.6							
Intersection Summary												
HCM 6th Ctrl Delay				36.0								
HCM 6th LOS				D								
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

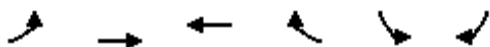
08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	230	1700	1170	480	160	890
Future Volume (vph)	230	1700	1170	480	160	890
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			0	0	375
Storage Lanes	1			1	1	2
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	0.88
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3574	1599	1752	2760
Flt Permitted	0.080				0.950	
Satd. Flow (perm)	149	3539	3574	1599	1752	2760
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				545		333
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	261	1932	1330	545	182	1011
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	1932	1330	545	182	1011
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		24	24		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	1	6	2		4	
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	4
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	10.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	16.0

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	13.0	64.0	51.0	51.0	31.0	31.0
Total Split (%)	13.7%	67.4%	53.7%	53.7%	32.6%	32.6%
Maximum Green (s)	8.0	58.0	45.0	45.0	25.0	25.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag		Lag	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	4.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	59.7	59.7	46.7	46.7	27.3	27.3
Actuated g/C Ratio	0.63	0.63	0.49	0.49	0.29	0.29
v/c Ratio	1.06	0.87	0.76	0.51	0.36	0.98
Control Delay	98.3	19.9	27.6	13.4	29.6	48.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.3	19.9	27.6	13.4	29.6	48.0
LOS	F	B	C	B	C	D
Approach Delay	29.2		23.4		45.2	
Approach LOS	C		C		D	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 30.8

Intersection LOS: C

Intersection Capacity Utilization 70.1%

ICU Level of Service C

Analysis Period (min) 15

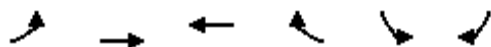
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	230	1700	1170	480	160	890
Future Volume (veh/h)	230	1700	1170	480	160	890
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	261	1932	1330	0	182	1011
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	341	2244	1772		502	787
Arrive On Green	0.09	0.63	0.66	0.00	0.28	0.28
Sat Flow, veh/h	1781	3647	3676	1598	1767	2768
Grp Volume(v), veh/h	261	1932	1330	0	182	1011
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1767	1384
Q Serve(g_s), s	6.5	41.7	23.8	0.0	7.8	27.0
Cycle Q Clear(g_c), s	6.5	41.7	23.8	0.0	7.8	27.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	341	2244	1772		502	787
V/C Ratio(X)	0.77	0.86	0.75		0.36	1.29
Avail Cap(c_a), veh/h	341	2244	1772		502	787
HCM Platoon Ratio	1.00	1.00	1.33	1.33	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.33	0.00	1.00	1.00
Uniform Delay (d), s/veh	17.0	14.1	12.3	0.0	27.1	34.0
Incr Delay (d2), s/veh	10.0	4.6	1.0	0.0	0.6	138.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	15.9	7.0	0.0	3.3	23.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	27.0	18.7	13.3	0.0	27.8	172.0
LnGrp LOS	C	B	B		C	F
Approach Vol, veh/h		2193	1330	A	1193	
Approach Delay, s/veh		19.7	13.3		150.0	
Approach LOS		B	B		F	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	13.0	51.0		31.0		64.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	8.0	45.0		25.0		58.0
Max Q Clear Time (g_c+I1), s	8.5	25.8		29.0		43.7
Green Ext Time (p_c), s	0.0	7.2		0.0		11.5

Intersection Summary

HCM 6th Ctrl Delay	50.9
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕			↕↕↕	↕	↕	↕	↕			
Traffic Volume (vph)	890	970	0	0	1350	300	300	0	800	0	0	0
Future Volume (vph)	890	970	0	0	1350	300	300	0	800	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	200		670	0		0
Storage Lanes	2		0	0		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	3460	3574	0	0	5136	1599	1752	1665	1568	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	3460	3574	0	0	5136	1599	1752	1665	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						326			413			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
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
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	967	1054	0	0	1467	326	326	0	870	0	0	0
Shared Lane Traffic (%)							100%					
Lane Group Flow (vph)	967	1054	0	0	1467	326	0	326	870	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Split	NA	Free			
Protected Phases	1	6			2		4	4				
Permitted Phases						2			Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	33.0	66.0			33.0	33.0	29.0	29.0				
Total Split (%)	34.7%	69.5%			34.7%	34.7%	30.5%	30.5%				
Maximum Green (s)	28.0	60.0			27.0	27.0	23.0	23.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0	-2.0	-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	29.1	63.5			30.4	30.4		23.5	95.0			
Actuated g/C Ratio	0.31	0.67			0.32	0.32		0.25	1.00			
v/c Ratio	0.91	0.44			0.89	0.44		0.79	0.55			
Control Delay	42.1	3.0			39.7	5.1		48.3	1.4			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	42.1	3.0			39.7	5.1		48.3	1.4			
LOS	D	A			D	A		D	A			
Approach Delay		21.7			33.4			14.2				
Approach LOS		C			C			B				

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 42 (44%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 24.1

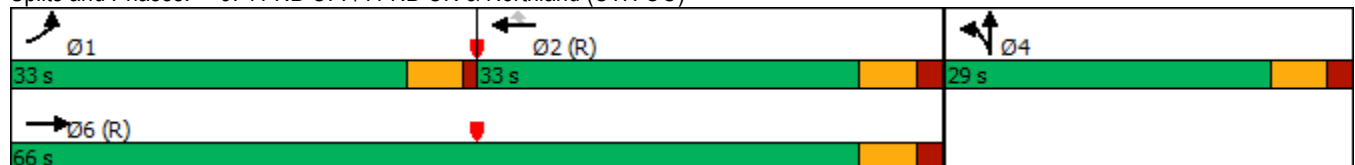
Intersection LOS: C

Intersection Capacity Utilization 69.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (veh/h)	890	970	0	0	1350	300	300	0	800	0	0	0
Future Volume (veh/h)	890	970	0	0	1350	300	300	0	800	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856			
Adj Flow Rate, veh/h	967	1054	0	0	1467	0	326	0	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3			
Cap, veh/h	1032	2754	0	0	2216		519	0				
Arrive On Green	0.59	1.00	0.00	0.00	0.43	0.00	0.15	0.00	0.00			
Sat Flow, veh/h	3483	3676	0	0	5316	1598	3534	0	1572			
Grp Volume(v), veh/h	967	1054	0	0	1467	0	326	0	0			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1716	1598	1767	0	1572			
Q Serve(g_s), s	24.2	0.0	0.0	0.0	21.6	0.0	8.2	0.0	0.0			
Cycle Q Clear(g_c), s	24.2	0.0	0.0	0.0	21.6	0.0	8.2	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1032	2754	0	0	2216		519	0				
V/C Ratio(X)	0.94	0.38	0.00	0.00	0.66		0.63	0.00				
Avail Cap(c_a), veh/h	1063	2754	0	0	2216		930	0				
HCM Platoon Ratio	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.46	0.46	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	18.6	0.0	0.0	0.0	21.5	0.0	38.1	0.0	0.0			
Incr Delay (d2), s/veh	8.0	0.2	0.0	0.0	1.6	0.0	1.8	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	6.6	0.1	0.0	0.0	8.6	0.0	3.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.6	0.2	0.0	0.0	23.1	0.0	39.9	0.0	0.0			
LnGrp LOS	C	A	A	A	C		D	A				
Approach Vol, veh/h	2021			1467			A			326		
Approach Delay, s/veh	12.8			23.1			39.9			A		
Approach LOS	B			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	32.1	44.9		18.0		77.0						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	28.0	27.0		23.0		60.0						
Max Q Clear Time (g_c+I1), s	26.2	23.6		10.2		2.0						
Green Ext Time (p_c), s	1.0	2.7		1.7		6.4						

Intersection Summary

HCM 6th Ctrl Delay 19.1

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

15: SB 41 OFF

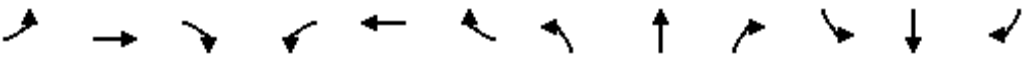
08/21/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	710	0	1050	0	0
Future Volume (vph)	0	710	0	1050	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865					
Flt Protected						
Satd. Flow (prot)	0	1611	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1611	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	772	0	1141	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	772	0	1141	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	58.6%			ICU Level of Service B		
Analysis Period (min)	15					

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	230	0	510	450	1110	0	0	1140	660
Future Volume (vph)	0	0	0	230	0	510	450	1110	0	0	1140	660
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		300	0		0	450		410
Storage Lanes	0		0	1		2	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1698	1698	2814	1787	3574	0	0	5085	1583
Flt Permitted				0.950	0.950		0.105					
Satd. Flow (perm)	0	0	0	1698	1698	2814	198	3574	0	0	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						194						517
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	258	0	573	506	1247	0	0	1281	742
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	129	129	573	506	1247	0	0	1281	742
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			18			14	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

3:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				24.0	24.0	24.0	36.0	76.0			40.0	40.0
Total Split (%)				24.0%	24.0%	24.0%	36.0%	76.0%			40.0%	40.0%
Maximum Green (s)				18.0	18.0	18.0	32.0	70.0			34.0	34.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-1.0	-1.0	-1.0	-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)				5.0	5.0	5.0	2.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Min	Min	Min	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				18.3	18.3	18.3	74.7	72.7			36.0	36.0
Actuated g/C Ratio				0.18	0.18	0.18	0.75	0.73			0.36	0.36
v/c Ratio				0.42	0.42	0.85	0.72	0.48			0.70	0.82
Control Delay				40.5	40.5	39.3	9.9	5.1			29.9	17.6
Queue Delay				0.0	0.0	0.0	0.8	1.1			0.0	0.0
Total Delay				40.5	40.5	39.3	10.7	6.2			29.9	17.6
LOS				D	D	D	B	A			C	B
Approach Delay					39.7			7.5			25.4	
Approach LOS					D			A			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 21.2

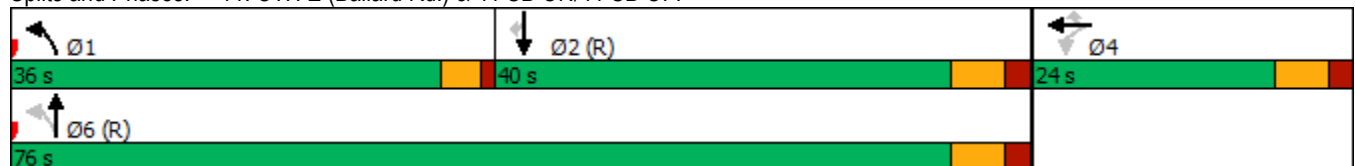
Intersection LOS: C

Intersection Capacity Utilization 85.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	230	0	510	450	1110	0	0	1140	660
Future Volume (veh/h)	0	0	0	230	0	510	450	1110	0	0	1140	660
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				258	0	573	506	1247	0	0	1281	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				682	0	607	746	2579	0	0	1838	
Arrive On Green				0.19	0.00	0.19	0.34	0.72	0.00	0.00	0.36	0.00
Sat Flow, veh/h				3591	0	3195	1795	3676	0	0	5274	1585
Grp Volume(v), veh/h				258	0	573	506	1247	0	0	1281	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1702	1585
Q Serve(g_s), s				6.3	0.0	17.7	15.4	15.0	0.0	0.0	21.4	0.0
Cycle Q Clear(g_c), s				6.3	0.0	17.7	15.4	15.0	0.0	0.0	21.4	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				682	0	607	746	2579	0	0	1838	
V/C Ratio(X)				0.38	0.00	0.94	0.68	0.48	0.00	0.00	0.70	
Avail Cap(c_a), veh/h				682	0	607	746	2579	0	0	1838	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.45	0.45	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				35.3	0.0	40.0	16.4	6.0	0.0	0.0	27.3	0.0
Incr Delay (d2), s/veh				0.5	0.0	23.7	2.3	0.3	0.0	0.0	2.2	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.8	0.0	8.8	4.4	4.8	0.0	0.0	8.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				35.8	0.0	63.7	18.7	6.3	0.0	0.0	29.6	0.0
LnGrp LOS				D	A	E	B	A	A	A	C	
Approach Vol, veh/h					831			1753			1281	A
Approach Delay, s/veh					55.0			9.9			29.6	
Approach LOS					E			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	36.0	40.0		24.0		76.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	32.0	34.0		18.0		70.0						
Max Q Clear Time (g_c+I1), s	17.4	23.4		19.7		17.0						
Green Ext Time (p_c), s	1.1	6.3		0.0		4.3						

Intersection Summary

HCM 6th Ctrl Delay	26.1
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	420	0	150	0	0	0	0	1140	190	580	790	0
Future Volume (vph)	420	0	150	0	0	0	0	1140	190	580	790	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		300	0		0	200		280	0		0
Storage Lanes	1		2	0		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.88	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.95	1.00
Frt			0.850							0.850		
Flt Protected	0.950	0.950								0.950		
Satd. Flow (prot)	1698	1698	2814	0	0	0	0	5136	1599	1787	3574	0
Flt Permitted	0.950	0.950								0.133		
Satd. Flow (perm)	1698	1698	2814	0	0	0	0	5136	1599	250	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			160						202			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	447	0	160	0	0	0	0	1213	202	617	840	0
Shared Lane Traffic (%)	50%											
Lane Group Flow (vph)	223	224	160	0	0	0	0	1213	202	617	840	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			14			18	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

3:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	24.0	24.0	24.0					32.0	32.0	44.0	76.0	
Total Split (%)	24.0%	24.0%	24.0%					32.0%	32.0%	44.0%	76.0%	
Maximum Green (s)	18.0	18.0	18.0					26.0	26.0	40.0	70.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0					-2.0	-2.0	-2.0	-2.0	
Total Lost Time (s)	5.0	5.0	5.0					4.0	4.0	2.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	17.7	17.7	17.7					28.0	28.0	75.3	73.3	
Actuated g/C Ratio	0.18	0.18	0.18					0.28	0.28	0.75	0.73	
v/c Ratio	0.74	0.75	0.25					0.84	0.34	0.72	0.32	
Control Delay	54.6	54.8	6.8					40.5	5.8	12.4	0.2	
Queue Delay	0.0	0.0	0.0					0.0	0.0	0.2	0.0	
Total Delay	54.6	54.8	6.8					40.5	5.8	12.6	0.2	
LOS	D	D	A					D	A	B	A	
Approach Delay		42.1						35.5			5.5	
Approach LOS		D						D			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 1 (1%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 24.1

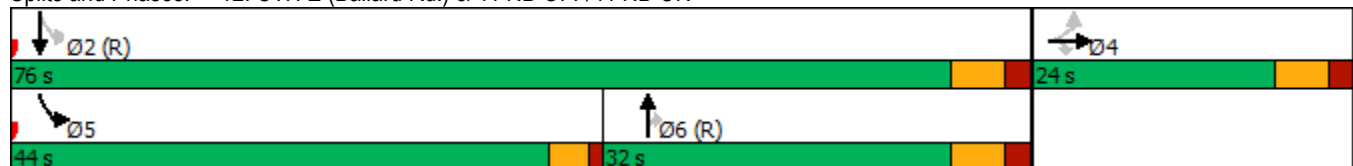
Intersection LOS: C

Intersection Capacity Utilization 85.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	420	0	150	0	0	0	0	1140	190	580	790	0
Future Volume (veh/h)	420	0	150	0	0	0	0	1140	190	580	790	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	447	0	160				0	1213	0	617	840	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	590	0	525				0	1573		869	2671	0
Arrive On Green	0.16	0.00	0.16				0.00	0.31	0.00	0.28	0.50	0.00
Sat Flow, veh/h	3591	0	3195				0	5316	1598	1795	3676	0
Grp Volume(v), veh/h	447	0	160				0	1213	0	617	840	0
Grp Sat Flow(s),veh/h/ln	1795	0	1598				0	1716	1598	1795	1791	0
Q Serve(g_s), s	11.9	0.0	4.4				0.0	21.4	0.0	23.8	13.9	0.0
Cycle Q Clear(g_c), s	11.9	0.0	4.4				0.0	21.4	0.0	23.8	13.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	590	0	525				0	1573		869	2671	0
V/C Ratio(X)	0.76	0.00	0.30				0.00	0.77		0.71	0.31	0.00
Avail Cap(c_a), veh/h	682	0	607				0	1573		869	2671	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	0.00	0.68	0.68	0.00
Uniform Delay (d), s/veh	39.9	0.0	36.8				0.0	31.5	0.0	22.1	9.8	0.0
Incr Delay (d2), s/veh	4.8	0.0	0.5				0.0	3.7	0.0	3.4	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	0.0	4.1				0.0	9.2	0.0	14.3	6.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.6	0.0	37.2				0.0	35.3	0.0	25.5	10.1	0.0
LnGrp LOS	D	A	D				A	D		C	B	A
Approach Vol, veh/h	607						1213			A		
Approach Delay, s/veh	42.7						35.3			16.6		
Approach LOS	D						D			B		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	78.6			21.4			44.0			34.6		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	70.0			18.0			40.0			26.0		
Max Q Clear Time (g_c+I1), s	15.9			13.9			25.8			23.4		
Green Ext Time (p_c), s	2.5			1.6			1.5			1.8		
Intersection Summary												
HCM 6th Ctrl Delay	28.3											
HCM 6th LOS	C											
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.												

APPENDIX O13

Year 2048 Build with Short Term Improvements

Synchro AM Peak Hour

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑↑						↑	↑↑
Traffic Volume (vph)	0	770	300	440	690	0	0	0	0	200	0	380
Future Volume (vph)	0	770	300	440	690	0	0	0	0	200	0	380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	5085	0	0	0	0	0	1770	2787
Flt Permitted				0.125							0.950	
Satd. Flow (perm)	0	5085	1583	233	5085	0	0	0	0	0	1770	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			385									368
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	987	385	564	885	0	0	0	0	256	0	487
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	987	385	564	885	0	0	0	0	0	256	487
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	71.9	71.9						20.1	20.1
Actuated g/C Ratio		0.30	0.30	0.72	0.72						0.20	0.20
v/c Ratio		0.65	0.52	0.75	0.24						0.72	0.57
Control Delay		32.8	5.6	18.1	0.4						49.2	11.6
Queue Delay		0.1	0.0	5.7	0.3						0.0	0.0
Total Delay		32.9	5.6	23.8	0.7						49.2	11.6
LOS		C	A	C	A						D	B
Approach Delay		25.2			9.7						24.6	
Approach LOS		C			A						C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 18.8

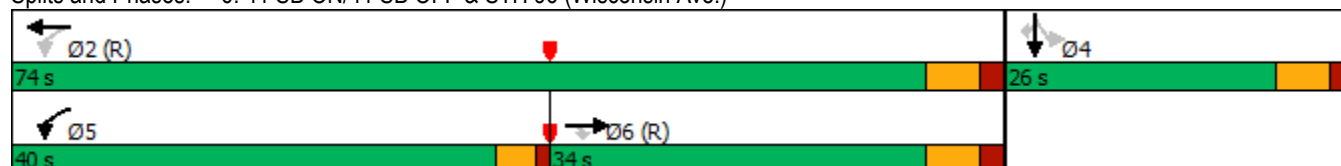
Intersection LOS: B

Intersection Capacity Utilization 58.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary
6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↗	↑↑↑						↖	↖↖
Traffic Volume (veh/h)	0	770	300	440	690	0	0	0	0	200	0	380
Future Volume (veh/h)	0	770	300	440	690	0	0	0	0	200	0	380
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	987	0	564	885	0				256	0	487
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1572		783	3614	0				378	0	592
Arrive On Green	0.00	0.31	0.00	0.72	1.00	0.00				0.21	0.00	0.21
Sat Flow, veh/h	0	5274	1585	1781	5274	0				1781	0	2790
Grp Volume(v), veh/h	0	987	0	564	885	0				256	0	487
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1702	0				1781	0	1395
Q Serve(g_s), s	0.0	16.6	0.0	12.5	0.0	0.0				13.2	0.0	16.7
Cycle Q Clear(g_c), s	0.0	16.6	0.0	12.5	0.0	0.0				13.2	0.0	16.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1572		783	3614	0				378	0	592
V/C Ratio(X)	0.00	0.63		0.72	0.24	0.00				0.68	0.00	0.82
Avail Cap(c_a), veh/h	0	1572		783	3614	0				392	0	614
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.67	0.67	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	29.7	0.0	4.6	0.0	0.0				36.2	0.0	37.6
Incr Delay (d2), s/veh	0.0	1.9	0.0	3.9	0.1	0.0				4.4	0.0	8.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.9	0.0	2.6	0.0	0.0				6.1	0.0	12.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	31.6	0.0	8.5	0.1	0.0				40.7	0.0	46.2
LnGrp LOS	A	C		A	A	A				D	A	D
Approach Vol, veh/h		987	A		1449						743	
Approach Delay, s/veh		31.6			3.4						44.3	
Approach LOS		C			A						D	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		74.8		25.2	40.0	34.8						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		2.0		18.7	14.5	18.6						
Green Ext Time (p_c), s		8.0		0.6	1.4	4.6						
Intersection Summary												
HCM 6th Ctrl Delay			21.7									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (vph)	250	720	0	0	800	80	330	0	390	0	0	0
Future Volume (vph)	250	720	0	0	800	80	330	0	390	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.86	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Flt Permitted	0.153						0.950					
Satd. Flow (perm)	285	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						99			365			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	309	889	0	0	988	99	407	0	481	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	309	889	0	0	988	99	407	0	481	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	70.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.70	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	0.42	0.36			0.51	0.18	1.10		0.54			
Control Delay	2.4	2.6			30.1	6.3	115.5		11.1			
Queue Delay	1.0	1.1			0.1	0.0	0.0		0.0			
Total Delay	3.4	3.7			30.2	6.3	115.5		11.1			
LOS	A	A			C	A	F		B			
Approach Delay		3.6			28.0			58.9				
Approach LOS		A			C			E				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 27.5

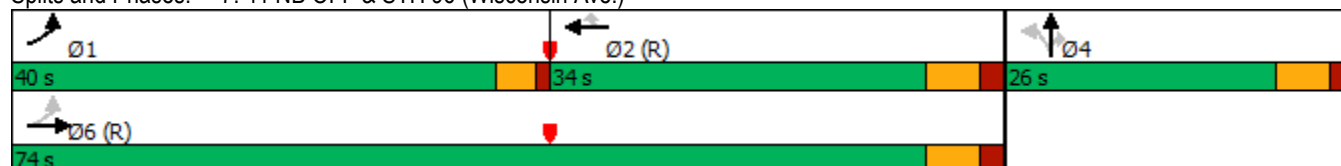
Intersection LOS: C

Intersection Capacity Utilization 58.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			   				  			
Traffic Volume (veh/h)	250	720	0	0	800	80	330	0	390	0	0	0
Future Volume (veh/h)	250	720	0	0	800	80	330	0	390	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	309	889	0	0	988	99	407	0	0			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	830	2702	0	0	2318	571	569	0				
Arrive On Green	0.24	0.51	0.00	0.00	0.36	0.36	0.16	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	6696	1585	3563	0	3170			
Grp Volume(v), veh/h	309	889	0	0	988	99	407	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1609	1585	1781	0	1585			
Q Serve(g_s), s	6.5	14.7	0.0	0.0	11.6	4.3	10.8	0.0	0.0			
Cycle Q Clear(g_c), s	6.5	14.7	0.0	0.0	11.6	4.3	10.8	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	830	2702	0	0	2318	571	569	0				
V/C Ratio(X)	0.37	0.33	0.00	0.00	0.43	0.17	0.72	0.00				
Avail Cap(c_a), veh/h	830	2702	0	0	2318	571	784	0				
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.72	0.72	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	9.2	9.5	0.0	0.0	24.2	21.8	39.9	0.0	0.0			
Incr Delay (d2), s/veh	0.9	0.2	0.0	0.0	0.6	0.7	1.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.4	6.3	0.0	0.0	4.4	1.7	4.9	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.1	9.7	0.0	0.0	24.7	22.5	41.8	0.0	0.0			
LnGrp LOS	B	A	A	A	C	C	D	A				
Approach Vol, veh/h	1198			1087			407			A		
Approach Delay, s/veh	9.8			24.5			41.8					
Approach LOS	A			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	40.0	40.0		20.0		80.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	36.0	28.0		20.0		68.0						
Max Q Clear Time (g_c+I1), s	8.5	13.6		12.8		16.7						
Green Ext Time (p_c), s	0.7	6.6		1.1		8.1						

Intersection Summary

HCM 6th Ctrl Delay	20.6
HCM 6th LOS	C

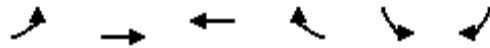
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

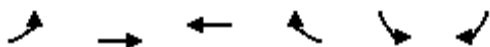
08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	280	1620	810	440	270	1190
Future Volume (vph)	280	1620	810	440	270	1190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			0	0	375
Storage Lanes	1			1	1	2
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	0.88
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1763	3539	3505	1568	1770	2787
Flt Permitted	0.119				0.950	
Satd. Flow (perm)	221	3539	3505	1568	1770	2787
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				576		12
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	368	2132	1066	579	355	1566
Shared Lane Traffic (%)						
Lane Group Flow (vph)	368	2132	1066	579	355	1566
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		24	24		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.01	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	pm+ov
Protected Phases	1	6	2		4	1
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	1
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	7.0

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	12.0
Total Split (s)	32.0	65.0	33.0	33.0	35.0	32.0
Total Split (%)	32.0%	65.0%	33.0%	33.0%	35.0%	32.0%
Maximum Green (s)	27.0	59.0	27.0	27.0	29.0	27.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	3.0
Lead/Lag	Lead		Lag	Lag		Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	3.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	65.1	65.1	30.5	30.5	26.9	62.5
Actuated g/C Ratio	0.65	0.65	0.30	0.30	0.27	0.62
v/c Ratio	0.60	0.93	1.00	0.66	0.75	0.90
Control Delay	22.0	25.1	63.4	6.7	43.2	24.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	25.1	63.4	6.7	43.2	24.0
LOS	C	C	E	A	D	C
Approach Delay		24.7	43.4		27.5	
Approach LOS		C	D		C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 30.7

Intersection LOS: C

Intersection Capacity Utilization 70.7%

ICU Level of Service C

Analysis Period (min) 15

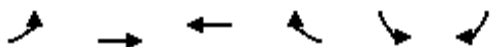
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	280	1620	810	440	270	1190
Future Volume (veh/h)	280	1620	810	440	270	1190
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	368	2132	1066	0	355	1566
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	429	2168	1461		552	1327
Arrive On Green	0.16	0.61	0.41	0.00	0.31	0.31
Sat Flow, veh/h	1781	3647	3618	1572	1781	2790
Grp Volume(v), veh/h	368	2132	1066	0	355	1566
Grp Sat Flow(s),veh/h/ln	1781	1777	1763	1572	1781	1395
Q Serve(g_s), s	11.3	58.5	25.4	0.0	17.2	31.0
Cycle Q Clear(g_c), s	11.3	58.5	25.4	0.0	17.2	31.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	429	2168	1461		552	1327
V/C Ratio(X)	0.86	0.98	0.73		0.64	1.18
Avail Cap(c_a), veh/h	651	2168	1461		552	1327
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	19.0	24.6	0.0	29.7	26.2
Incr Delay (d2), s/veh	7.3	15.8	0.3	0.0	2.9	89.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.1	25.9	10.3	0.0	7.7	44.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	26.4	34.8	24.9	0.0	32.6	115.5
LnGrp LOS	C	C	C		C	F
Approach Vol, veh/h		2500	1066	A	1921	
Approach Delay, s/veh		33.6	24.9		100.2	
Approach LOS		C	C		F	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	19.6	45.4		35.0		65.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	27.0	27.0		29.0		59.0
Max Q Clear Time (g_c+I1), s	13.3	27.4		33.0		60.5
Green Ext Time (p_c), s	1.3	0.0		0.0		0.0

Intersection Summary

HCM 6th Ctrl Delay	55.2
HCM 6th LOS	E

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕			↕↕↕	↕	↕	↕	↕			
Traffic Volume (vph)	910	980	0	0	990	180	260	0	480	0	0	0
Future Volume (vph)	910	980	0	0	990	180	260	0	480	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	200		670	0		0
Storage Lanes	2		0	0		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	3467	3574	0	0	5085	1583	1671	1588	1495	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	3467	3574	0	0	5085	1583	1671	1588	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						237			327			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	1197	1289	0	0	1303	237	342	0	632	0	0	0
Shared Lane Traffic (%)							100%					
Lane Group Flow (vph)	1197	1289	0	0	1303	237	0	342	632	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Split	NA	Free			
Protected Phases	1	6			2		4	4				
Permitted Phases						2			Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			19.0	19.0	10.0	10.0				
Minimum Split (s)	12.0	26.0			25.0	25.0	20.0	20.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	42.0	67.0			25.0	25.0	23.0	23.0				
Total Split (%)	46.7%	74.4%			27.8%	27.8%	25.6%	25.6%				
Maximum Green (s)	37.0	61.0			19.0	19.0	17.0	17.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0	-2.0	-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	None	Min			C-Min	C-Min	None	None				
Act Effect Green (s)	36.4	63.0			22.6	22.6		19.0	90.0			
Actuated g/C Ratio	0.40	0.70			0.25	0.25		0.21	1.00			
v/c Ratio	0.85	0.52			1.02	0.41		1.02	0.42			
Control Delay	31.3	7.2			66.1	6.4		92.0	0.9			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	31.3	7.2			66.1	6.4		92.0	0.9			
LOS	C	A			E	A		F	A			
Approach Delay		18.8			56.9			32.9				
Approach LOS		B			E			C				

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 33.3

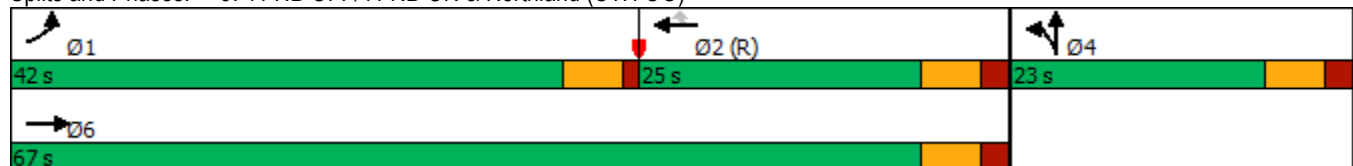
Intersection LOS: C

Intersection Capacity Utilization 63.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (veh/h)	910	980	0	0	990	180	260	0	480	0	0	0
Future Volume (veh/h)	910	980	0	0	990	180	260	0	480	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781			
Adj Flow Rate, veh/h	1197	1289	0	0	1303	0	342	0	0			
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76			
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8			
Cap, veh/h	1358	2717	0	0	1656		517	0				
Arrive On Green	0.39	0.76	0.00	0.00	0.32	0.00	0.15	0.00	0.00			
Sat Flow, veh/h	3483	3676	0	0	5274	1585	3393	0	1510			
Grp Volume(v), veh/h	1197	1289	0	0	1303	0	342	0	0			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1702	1585	1697	0	1510			
Q Serve(g_s), s	28.8	12.2	0.0	0.0	20.8	0.0	8.5	0.0	0.0			
Cycle Q Clear(g_c), s	28.8	12.2	0.0	0.0	20.8	0.0	8.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1358	2717	0	0	1656		517	0				
V/C Ratio(X)	0.88	0.47	0.00	0.00	0.79		0.66	0.00				
Avail Cap(c_a), veh/h	1471	2717	0	0	1656		716	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.31	0.31	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	25.5	4.1	0.0	0.0	27.6	0.0	35.9	0.0	0.0			
Incr Delay (d2), s/veh	2.1	0.0	0.0	0.0	3.9	0.0	2.1	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	11.7	3.2	0.0	0.0	8.8	0.0	3.6	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.6	4.1	0.0	0.0	31.4	0.0	38.0	0.0	0.0			
LnGrp LOS	C	A	A	A	C		D	A				
Approach Vol, veh/h	2486			1303			A			342		
Approach Delay, s/veh	15.4			31.4			38.0			A		
Approach LOS	B			C			D					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	39.1	33.2		17.7		72.3						
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	37.0	19.0		17.0		61.0						
Max Q Clear Time (g_c+I1), s	30.8	22.8		10.5		14.2						
Green Ext Time (p_c), s	3.3	0.0		1.2		8.6						
Intersection Summary												
HCM 6th Ctrl Delay	22.4											
HCM 6th LOS	C											
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

15: SB 41 OFF

08/21/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr t						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	300	0	940	170	1400	0	0	1180	780
Future Volume (vph)	0	0	0	300	0	940	170	1400	0	0	1180	780
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		300	0		0	450		410
Storage Lanes	0		0	1		2	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1681	1681	2787	1787	3574	0	0	5085	1583
Flt Permitted				0.950	0.950		0.133					
Satd. Flow (perm)	0	0	0	1681	1681	2787	250	3574	0	0	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						824
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	361	0	1133	205	1687	0	0	1422	940
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	180	181	1133	205	1687	0	0	1422	940
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			18			16	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				39.0	39.0	39.0	29.0	61.0			32.0	32.0
Total Split (%)				39.0%	39.0%	39.0%	29.0%	61.0%			32.0%	32.0%
Maximum Green (s)				33.0	33.0	33.0	25.0	55.0			26.0	26.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-1.0	-1.0	-1.0	-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)				5.0	5.0	5.0	2.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Min	Min	Min	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				34.0	34.0	34.0	59.0	57.0			28.0	28.0
Actuated g/C Ratio				0.34	0.34	0.34	0.59	0.57			0.28	0.28
v/c Ratio				0.32	0.32	1.14	0.36	0.83			1.00	0.91
Control Delay				26.3	26.3	104.1	6.8	8.5			60.4	18.9
Queue Delay				0.3	0.3	0.0	0.0	25.8			21.7	0.0
Total Delay				26.6	26.6	104.1	6.8	34.4			82.1	18.9
LOS				C	C	F	A	C			F	B
Approach Delay					85.3			31.4			56.9	
Approach LOS					F			C			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 55.9

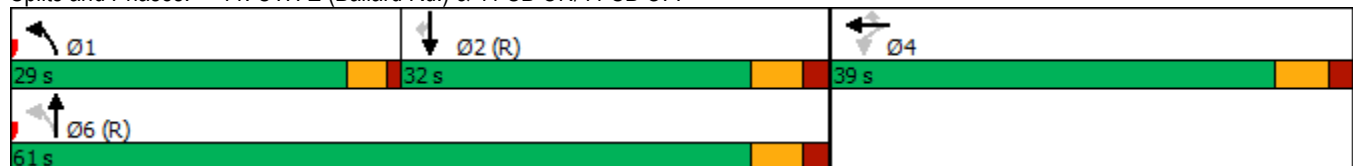
Intersection LOS: E

Intersection Capacity Utilization 112.1%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	300	0	940	170	1400	0	0	1180	780
Future Volume (veh/h)	0	0	0	300	0	940	170	1400	0	0	1180	780
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				361	0	1133	205	1687	0	0	1422	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				1211	0	1078	558	2042	0	0	1430	
Arrive On Green				0.34	0.00	0.34	0.09	0.19	0.00	0.00	0.28	0.00
Sat Flow, veh/h				3563	0	3170	1795	3676	0	0	5274	1585
Grp Volume(v), veh/h				361	0	1133	205	1687	0	0	1422	0
Grp Sat Flow(s),veh/h/ln				1781	0	1585	1795	1791	0	0	1702	1585
Q Serve(g_s), s				7.4	0.0	34.0	6.6	45.3	0.0	0.0	27.8	0.0
Cycle Q Clear(g_c), s				7.4	0.0	34.0	6.6	45.3	0.0	0.0	27.8	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1211	0	1078	558	2042	0	0	1430	
V/C Ratio(X)				0.30	0.00	1.05	0.37	0.83	0.00	0.00	0.99	
Avail Cap(c_a), veh/h				1211	0	1078	558	2042	0	0	1430	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.35	0.35	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				24.2	0.0	33.0	19.8	35.8	0.0	0.0	35.9	0.0
Incr Delay (d2), s/veh				0.2	0.0	41.9	0.7	1.4	0.0	0.0	22.6	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.1	0.0	18.9	2.9	22.0	0.0	0.0	14.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				24.4	0.0	74.9	20.5	37.3	0.0	0.0	58.5	0.0
LnGrp LOS				C	A	F	C	D	A	A	E	
Approach Vol, veh/h					1494			1892			1422	A
Approach Delay, s/veh					62.7			35.5			58.5	
Approach LOS					E			D			E	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	29.0	32.0		39.0		61.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	25.0	26.0		33.0		55.0						
Max Q Clear Time (g_c+I1), s	8.6	29.8		36.0		47.3						
Green Ext Time (p_c), s	0.4	0.0		0.0		3.8						

Intersection Summary

HCM 6th Ctrl Delay	50.7
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	770	0	410	0	0	0	0	800	280	1130	350	0
Future Volume (vph)	770	0	410	0	0	0	0	800	280	1130	350	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		300	0		0	200		280	0		0
Storage Lanes	1		2	0		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.88	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.95	1.00
Frt			0.850							0.850		
Flt Protected	0.950	0.950								0.950		
Satd. Flow (prot)	1681	1681	2787	0	0	0	0	5136	1599	1787	3574	0
Flt Permitted	0.950	0.950								0.167		
Satd. Flow (perm)	1681	1681	2787	0	0	0	0	5136	1599	314	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			466						318			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	875	0	466	0	0	0	0	909	318	1284	398	0
Shared Lane Traffic (%)	50%											
Lane Group Flow (vph)	437	438	466	0	0	0	0	909	318	1284	398	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			16			18	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	30.0	30.0	30.0					26.0	26.0	44.0	70.0	
Total Split (%)	30.0%	30.0%	30.0%					26.0%	26.0%	44.0%	70.0%	
Maximum Green (s)	24.0	24.0	24.0					20.0	20.0	40.0	64.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0					-2.0	-2.0	-2.0	-2.0	
Total Lost Time (s)	5.0	5.0	5.0					4.0	4.0	2.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	25.0	25.0	25.0					22.0	22.0	68.0	66.0	
Actuated g/C Ratio	0.25	0.25	0.25					0.22	0.22	0.68	0.66	
v/c Ratio	1.04	1.04	0.45					0.81	0.53	1.54	0.17	
Control Delay	92.9	93.5	4.4					43.4	7.4	265.4	0.3	
Queue Delay	22.1	21.4	0.0					0.0	0.0	0.1	0.0	
Total Delay	115.0	114.9	4.4					43.4	7.4	265.5	0.3	
LOS	F	F	A					D	A	F	A	
Approach Delay		76.5						34.1			202.8	
Approach LOS		E						C			F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 4 (4%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.54

Intersection Signal Delay: 114.2

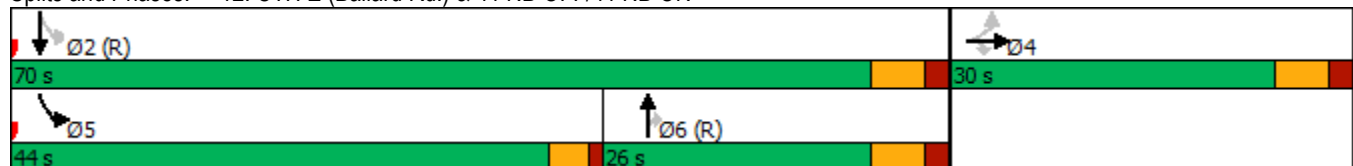
Intersection LOS: F

Intersection Capacity Utilization 112.1%

ICU Level of Service H

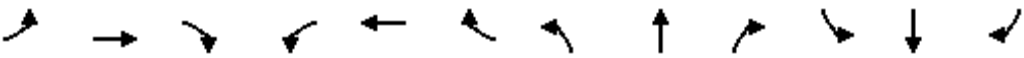
Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	770	0	410	0	0	0	0	800	280	1130	350	0
Future Volume (veh/h)	770	0	410	0	0	0	0	800	280	1130	350	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	875	0	466				0	909	0	1284	398	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	891	0	793				0	1132		859	2364	0
Arrive On Green	0.25	0.00	0.25				0.00	0.22	0.00	0.14	0.22	0.00
Sat Flow, veh/h	3563	0	3170				0	5316	1598	1795	3676	0
Grp Volume(v), veh/h	875	0	466				0	909	0	1284	398	0
Grp Sat Flow(s),veh/h/ln	1781	0	1585				0	1716	1598	1795	1791	0
Q Serve(g_s), s	24.4	0.0	12.9				0.0	16.7	0.0	42.0	9.0	0.0
Cycle Q Clear(g_c), s	24.4	0.0	12.9				0.0	16.7	0.0	42.0	9.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	891	0	793				0	1132		859	2364	0
V/C Ratio(X)	0.98	0.00	0.59				0.00	0.80		1.50	0.17	0.00
Avail Cap(c_a), veh/h	891	0	793				0	1132		859	2364	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	0.00	0.27	0.27	0.00
Uniform Delay (d), s/veh	37.3	0.0	33.0				0.0	36.9	0.0	36.3	16.8	0.0
Incr Delay (d2), s/veh	25.8	0.0	1.4				0.0	6.1	0.0	224.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.6	0.0	11.5				0.0	7.5	0.0	76.4	4.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.1	0.0	34.4				0.0	43.0	0.0	260.9	16.9	0.0
LnGrp LOS	E	A	C				A	D		F	B	A
Approach Vol, veh/h	1341						909			1682		
Approach Delay, s/veh	53.1						43.0			203.1		
Approach LOS	D						D			F		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	70.0			30.0			44.0			26.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	64.0			24.0			40.0			20.0		
Max Q Clear Time (g_c+I1), s	11.0			26.4			44.0			18.7		
Green Ext Time (p_c), s	1.1			0.0			0.0			0.8		

Intersection Summary

HCM 6th Ctrl Delay 115.0

HCM 6th LOS F

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX O14

Year 2048 Build with Short Term Improvements

Synchro PM Peak Hour

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑↑						↑	↑↑
Traffic Volume (vph)	0	1900	590	690	1750	0	0	0	0	270	0	650
Future Volume (vph)	0	1900	590	690	1750	0	0	0	0	270	0	650
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	0		235
Storage Lanes	1		1	1		0	0		0	0		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	5085	0	0	0	0	0	1787	2814
Flt Permitted				0.108							0.950	
Satd. Flow (perm)	0	5085	1583	201	5085	0	0	0	0	0	1787	2814
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			428									76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1939	602	704	1786	0	0	0	0	276	0	663
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1939	602	704	1786	0	0	0	0	0	276	663
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		39.0	39.0	38.0	77.0					23.0	23.0	23.0
Total Split (%)		39.0%	39.0%	38.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		33.0	33.0	34.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0						-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		35.0	35.0	73.0	73.0						19.0	19.0
Actuated g/C Ratio		0.35	0.35	0.73	0.73						0.19	0.19
v/c Ratio		1.09	0.72	1.04	0.48						0.81	1.11
Control Delay		82.4	13.6	33.3	0.3						59.0	106.2
Queue Delay		4.7	0.0	24.5	9.1						0.0	0.0
Total Delay		87.1	13.6	57.8	9.3						59.0	106.2
LOS		F	B	E	A						E	F
Approach Delay		69.7			23.0						92.3	
Approach LOS		E			C						F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 2:WBTL and 6:EBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 53.8

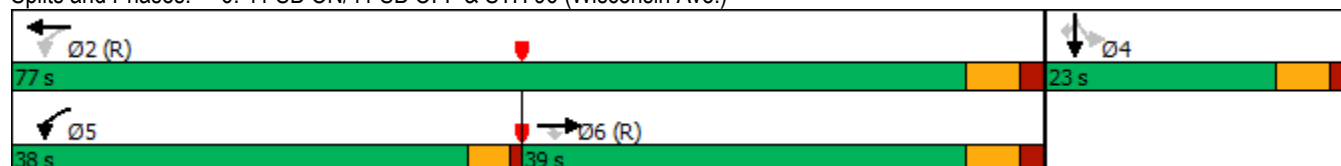
Intersection LOS: D

Intersection Capacity Utilization 104.8%

ICU Level of Service G

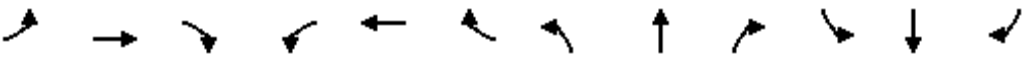
Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑↑						↖	↗
Traffic Volume (veh/h)	0	1900	590	690	1750	0	0	0	0	270	0	650
Future Volume (veh/h)	0	1900	590	690	1750	0	0	0	0	270	0	650
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1939	0	704	1786	0				276	0	663
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1787		678	3727	0				341	0	534
Arrive On Green	0.00	0.35	0.00	0.45	0.97	0.00				0.19	0.00	0.19
Sat Flow, veh/h	0	5274	1585	1781	5274	0				1795	0	2812
Grp Volume(v), veh/h	0	1939	0	704	1786	0				276	0	663
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1702	0				1795	0	1406
Q Serve(g_s), s	0.0	35.0	0.0	34.0	1.9	0.0				14.7	0.0	19.0
Cycle Q Clear(g_c), s	0.0	35.0	0.0	34.0	1.9	0.0				14.7	0.0	19.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1787		678	3727	0				341	0	534
V/C Ratio(X)	0.00	1.08		1.04	0.48	0.00				0.81	0.00	1.24
Avail Cap(c_a), veh/h	0	1787		678	3727	0				341	0	534
HCM Platoon Ratio	1.00	1.00	1.00	1.33	1.33	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	32.5	0.0	22.3	0.4	0.0				38.8	0.0	40.5
Incr Delay (d2), s/veh	0.0	48.4	0.0	22.5	0.0	0.0				13.5	0.0	123.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	21.9	0.0	11.7	0.3	0.0				7.7	0.0	22.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	80.9	0.0	44.8	0.5	0.0				52.3	0.0	164.2
LnGrp LOS	A	F		F	A	A				D	A	F
Approach Vol, veh/h		1939	A		2490						939	
Approach Delay, s/veh		80.9			13.0						131.3	
Approach LOS		F			B						F	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		77.0		23.0	38.0	39.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		71.0		17.0	34.0	33.0						
Max Q Clear Time (g_c+I1), s		3.9		21.0	36.0	37.0						
Green Ext Time (p_c), s		25.4		0.0	0.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			58.2									
HCM 6th LOS			E									
Notes												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Future Volume (vph)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	0		180	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.86	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1770	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Flt Permitted	0.121						0.950					
Satd. Flow (perm)	225	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						357			246			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	1092	1122	0	0	1990	357	500	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	1092	1122	0	0	1990	357	500	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	41.0	76.0			35.0	35.0	24.0	24.0	24.0			
Total Split (%)	41.0%	76.0%			35.0%	35.0%	24.0%	24.0%	24.0%			
Maximum Green (s)	37.0	70.0			29.0	29.0	18.0	18.0	18.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	72.0	72.0			31.0	31.0	20.0		20.0			
Actuated g/C Ratio	0.72	0.72			0.31	0.31	0.20		0.20			
v/c Ratio	1.49	0.44			1.00	0.48	1.49		0.66			
Control Delay	237.7	2.9			55.7	5.3	266.2		23.1			
Queue Delay	1.6	17.3			0.0	0.0	0.0		0.0			
Total Delay	239.3	20.3			55.7	5.3	266.2		23.1			
LOS	F	C			E	A	F		C			
Approach Delay	128.3				48.1		144.6					
Approach LOS	F				D		F					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.49

Intersection Signal Delay: 97.4

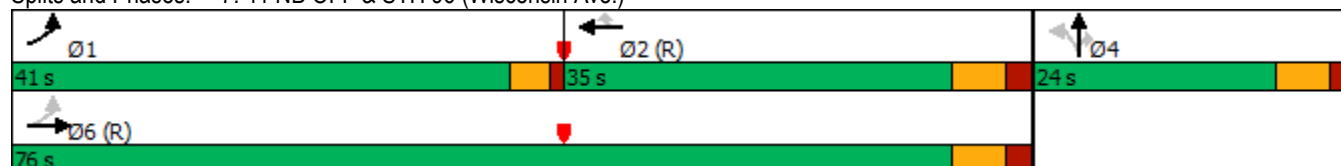
Intersection LOS: F

Intersection Capacity Utilization 104.8%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			   				  			
Traffic Volume (veh/h)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Future Volume (veh/h)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	1092	1122	0	0	1990	357	500	0	0			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	733	2628	0	0	2120	522	643	0				
Arrive On Green	0.25	0.50	0.00	0.00	0.33	0.33	0.18	0.00	0.00			
Sat Flow, veh/h	1781	3647	0	0	6696	1585	3563	0	3170			
Grp Volume(v), veh/h	1092	1122	0	0	1990	357	500	0	0			
Grp Sat Flow(s),veh/h/ln	1781	1777	0	0	1609	1585	1781	0	1585			
Q Serve(g_s), s	37.0	20.2	0.0	0.0	30.0	19.5	13.4	0.0	0.0			
Cycle Q Clear(g_c), s	37.0	20.2	0.0	0.0	30.0	19.5	13.4	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	733	2628	0	0	2120	522	643	0				
V/C Ratio(X)	1.49	0.43	0.00	0.00	0.94	0.68	0.78	0.00				
Avail Cap(c_a), veh/h	733	2628	0	0	2120	522	713	0				
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.09	0.09	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	32.7	11.7	0.0	0.0	32.5	29.0	39.1	0.0	0.0			
Incr Delay (d2), s/veh	221.5	0.0	0.0	0.0	9.6	7.1	5.0	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	63.5	8.6	0.0	0.0	12.7	8.3	6.2	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	254.3	11.7	0.0	0.0	42.2	36.1	44.0	0.0	0.0			
LnGrp LOS	F	B	A	A	D	D	D	A				
Approach Vol, veh/h	2214				2347				500			
Approach Delay, s/veh	131.3				41.2				44.0			
Approach LOS	F				D				D			
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	41.0	37.0	22.0		78.0							
Change Period (Y+Rc), s	4.0	6.0	6.0		6.0							
Max Green Setting (Gmax), s	37.0	29.0	18.0		70.0							
Max Q Clear Time (g_c+l1), s	39.0	32.0	15.4		22.2							
Green Ext Time (p_c), s	0.0	0.0	0.7		11.3							

Intersection Summary

HCM 6th Ctrl Delay 80.9

HCM 6th LOS F

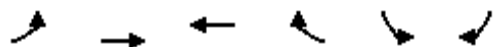
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

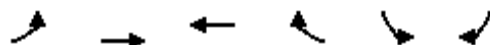
08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	310	2230	1430	560	210	1320
Future Volume (vph)	310	2230	1430	560	210	1320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			0	0	375
Storage Lanes	1			1	1	2
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	0.88
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3574	1599	1752	2760
Flt Permitted	0.114				0.950	
Satd. Flow (perm)	212	3539	3574	1599	1752	2760
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				460		2
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	352	2534	1625	636	239	1500
Shared Lane Traffic (%)						
Lane Group Flow (vph)	352	2534	1625	636	239	1500
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		24	24		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	pm+pt	NA	NA	Perm	Prot	pm+ov
Protected Phases	1	6	2		4	1
Permitted Phases	6			2		4
Detector Phase	1	6	2	2	4	1
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	7.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	13.0

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	29.0	64.0	35.0	35.0	31.0	29.0
Total Split (%)	30.5%	67.4%	36.8%	36.8%	32.6%	30.5%
Maximum Green (s)	24.0	58.0	29.0	29.0	25.0	24.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	3.0
Lead/Lag	Lead		Lag		Lead	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	3.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	66.1	66.1	32.1	32.1	20.9	55.9
Actuated g/C Ratio	0.70	0.70	0.34	0.34	0.22	0.59
v/c Ratio	0.55	1.03	1.35	0.75	0.62	0.92
Control Delay	19.0	43.0	181.2	18.1	40.0	28.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.0	43.0	181.2	18.1	40.0	28.5
LOS	B	D	F	B	D	C
Approach Delay	40.1		135.3		30.1	
Approach LOS	D		F		C	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBTL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.35

Intersection Signal Delay: 68.8

Intersection LOS: E

Intersection Capacity Utilization 92.4%

ICU Level of Service F

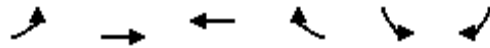
Analysis Period (min) 15

Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary 8: Northland (CTH OO) & SB 41 OFF

08/21/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	310	2230	1430	560	210	1320
Future Volume (veh/h)	310	2230	1430	560	210	1320
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	352	2534	1625	0	239	1500
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	411	2244	1437		502	1337
Arrive On Green	0.19	0.63	0.27	0.00	0.28	0.28
Sat Flow, veh/h	1781	3647	3676	1598	1767	2768
Grp Volume(v), veh/h	352	2534	1625	0	239	1500
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1598	1767	1384
Q Serve(g_s), s	14.0	60.0	38.1	0.0	10.6	27.0
Cycle Q Clear(g_c), s	14.0	60.0	38.1	0.0	10.6	27.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	411	2244	1437		502	1337
V/C Ratio(X)	0.86	1.13	1.13		0.48	1.12
Avail Cap(c_a), veh/h	545	2244	1437		502	1337
HCM Platoon Ratio	1.00	1.00	0.67	0.67	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	17.5	34.7	0.0	28.1	24.6
Incr Delay (d2), s/veh	10.1	64.4	59.8	0.0	1.0	65.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.8	40.9	29.0	0.0	4.6	38.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	37.3	81.9	94.5	0.0	29.1	89.9
LnGrp LOS	D	F	F		C	F
Approach Vol, veh/h		2886	1625	A	1739	
Approach Delay, s/veh		76.5	94.5		81.6	
Approach LOS		E	F		F	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	21.9	42.1		31.0		64.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	24.0	29.0		25.0		58.0
Max Q Clear Time (g_c+I1), s	16.0	40.1		29.0		62.0
Green Ext Time (p_c), s	0.9	0.0		0.0		0.0

Intersection Summary

HCM 6th Ctrl Delay	82.6
HCM 6th LOS	F

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕			↕↕↕	↕	↕	↕	↕			
Traffic Volume (vph)	1360	1080	0	0	1580	360	410	0	880	0	0	0
Future Volume (vph)	1360	1080	0	0	1580	360	410	0	880	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	200		670	0		0
Storage Lanes	2		0	0		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.91	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	3460	3574	0	0	5136	1599	1752	1665	1568	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	3460	3574	0	0	5136	1599	1752	1665	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						387			354			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
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
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	1478	1174	0	0	1717	391	446	0	957	0	0	0
Shared Lane Traffic (%)							100%					
Lane Group Flow (vph)	1478	1174	0	0	1717	391	0	446	957	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Split	NA	Free			
Protected Phases	1	6			2		4	4				
Permitted Phases						2			Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	40.0	70.0			30.0	30.0	25.0	25.0				
Total Split (%)	42.1%	73.7%			31.6%	31.6%	26.3%	26.3%				
Maximum Green (s)	35.0	64.0			24.0	24.0	19.0	19.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0	-2.0	-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	36.0	66.0			26.0	26.0		21.0	95.0			
Actuated g/C Ratio	0.38	0.69			0.27	0.27		0.22	1.00			
v/c Ratio	1.13	0.47			1.22	0.54		1.21	0.61			
Control Delay	86.3	3.0			138.6	6.3		152.3	1.8			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	86.3	3.0			138.6	6.3		152.3	1.8			
LOS	F	A			F	A		F	A			
Approach Delay		49.4			114.0			49.6				
Approach LOS		D			F			D				

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 42 (44%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 71.6

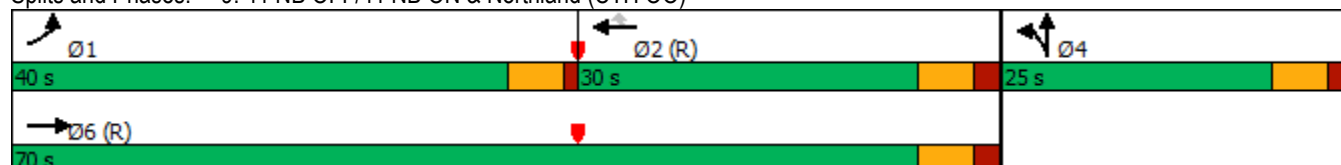
Intersection LOS: E

Intersection Capacity Utilization 90.7%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			  							
Traffic Volume (veh/h)	1360	1080	0	0	1580	360	410	0	880	0	0	0
Future Volume (veh/h)	1360	1080	0	0	1580	360	410	0	880	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856			
Adj Flow Rate, veh/h	1478	1174	0	0	1717	0	446	0	0			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92			
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3			
Cap, veh/h	1320	2649	0	0	1639		623	0				
Arrive On Green	0.63	1.00	0.00	0.00	0.32	0.00	0.18	0.00	0.00			
Sat Flow, veh/h	3483	3676	0	0	5316	1598	3534	0	1572			
Grp Volume(v), veh/h	1478	1174	0	0	1717	0	446	0	0			
Grp Sat Flow(s),veh/h/ln	1742	1791	0	0	1716	1598	1767	0	1572			
Q Serve(g_s), s	36.0	0.0	0.0	0.0	30.2	0.0	11.3	0.0	0.0			
Cycle Q Clear(g_c), s	36.0	0.0	0.0	0.0	30.2	0.0	11.3	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1320	2649	0	0	1639		623	0				
V/C Ratio(X)	1.12	0.44	0.00	0.00	1.05		0.72	0.00				
Avail Cap(c_a), veh/h	1320	2649	0	0	1639		781	0				
HCM Platoon Ratio	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.10	0.10	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	17.4	0.0	0.0	0.0	32.4	0.0	36.9	0.0	0.0			
Incr Delay (d2), s/veh	55.1	0.1	0.0	0.0	35.9	0.0	2.9	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	18.8	0.0	0.0	0.0	17.6	0.0	5.1	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.6	0.1	0.0	0.0	68.3	0.0	39.8	0.0	0.0			
LnGrp LOS	F	A	A	A	F		D	A				
Approach Vol, veh/h	2652			1717			A	446	A			
Approach Delay, s/veh	40.5			68.3				39.8				
Approach LOS	D			E				D				
Timer - Assigned Phs	1	2	4			6						
Phs Duration (G+Y+Rc), s	40.0	34.2	20.8			74.2						
Change Period (Y+Rc), s	5.0	6.0	6.0			6.0						
Max Green Setting (Gmax), s	35.0	24.0	19.0			64.0						
Max Q Clear Time (g_c+I1), s	38.0	32.2	13.3			2.0						
Green Ext Time (p_c), s	0.0	0.0	1.5			7.5						
Intersection Summary												
HCM 6th Ctrl Delay	50.3											
HCM 6th LOS	D											
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

15: SB 41 OFF

08/21/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frnt						
Flt Protected						
Satd. Flow (prot)	0	1863	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	1863	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	300	0	720	540	1390	0	0	1560	920
Future Volume (vph)	0	0	0	300	0	720	540	1390	0	0	1560	920
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		300	0		0	450		410
Storage Lanes	0		0	1		2	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1698	1698	2814	1787	3574	0	0	5085	1583
Flt Permitted				0.950	0.950		0.125					
Satd. Flow (perm)	0	0	0	1698	1698	2814	235	3574	0	0	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						571
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	337	0	809	607	1562	0	0	1753	1034
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	168	169	809	607	1562	0	0	1753	1034
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			18			14	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				32.0	32.0	32.0	34.0	68.0			34.0	34.0
Total Split (%)				32.0%	32.0%	32.0%	34.0%	68.0%			34.0%	34.0%
Maximum Green (s)				26.0	26.0	26.0	30.0	62.0			28.0	28.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-1.0	-1.0	-1.0	-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)				5.0	5.0	5.0	2.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Min	Min	Min	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				27.0	27.0	27.0	66.0	64.0			30.0	30.0
Actuated g/C Ratio				0.27	0.27	0.27	0.66	0.64			0.30	0.30
v/c Ratio				0.37	0.37	0.99	0.93	0.68			1.15	1.18
Control Delay				32.4	32.5	63.8	25.7	8.8			108.7	110.8
Queue Delay				0.0	0.0	0.0	10.4	14.3			0.0	0.0
Total Delay				32.4	32.5	63.8	36.0	23.1			108.7	110.8
LOS				C	C	E	D	C			F	F
Approach Delay					54.6			26.7			109.5	
Approach LOS					D			C			F	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:SBT and 6:NBTL, Start of 1st Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.18

Intersection Signal Delay: 69.8

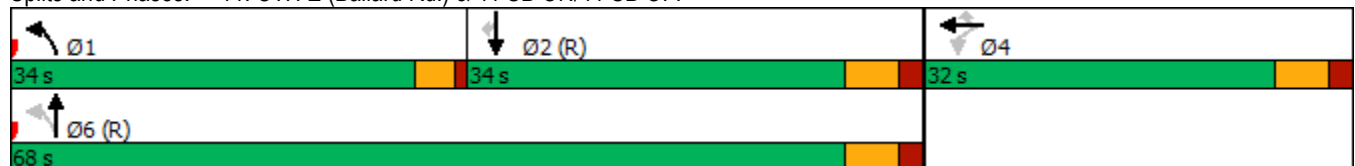
Intersection LOS: E

Intersection Capacity Utilization 106.0%

ICU Level of Service G

Analysis Period (min) 15

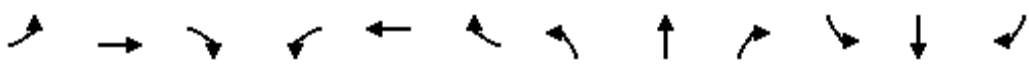
Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	300	0	720	540	1390	0	0	1560	920
Future Volume (veh/h)	0	0	0	300	0	720	540	1390	0	0	1560	920
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				337	0	809	607	1562	0	0	1753	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				970	0	863	647	2292	0	0	1532	
Arrive On Green				0.27	0.00	0.27	0.11	0.21	0.00	0.00	0.30	0.00
Sat Flow, veh/h				3591	0	3195	1795	3676	0	0	5274	1585
Grp Volume(v), veh/h				337	0	809	607	1562	0	0	1753	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1702	1585
Q Serve(g_s), s				7.6	0.0	24.7	29.5	40.2	0.0	0.0	30.0	0.0
Cycle Q Clear(g_c), s				7.6	0.0	24.7	29.5	40.2	0.0	0.0	30.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				970	0	863	647	2292	0	0	1532	
V/C Ratio(X)				0.35	0.00	0.94	0.94	0.68	0.00	0.00	1.14	
Avail Cap(c_a), veh/h				970	0	863	647	2292	0	0	1532	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.23	0.23	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				29.4	0.0	35.7	37.6	30.0	0.0	0.0	35.0	0.0
Incr Delay (d2), s/veh				0.3	0.0	17.6	7.7	0.4	0.0	0.0	73.2	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.3	0.0	11.5	17.2	19.2	0.0	0.0	22.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				29.7	0.0	53.3	45.3	30.4	0.0	0.0	108.2	0.0
LnGrp LOS				C	A	D	D	C	A	A	F	
Approach Vol, veh/h					1146			2169			1753	A
Approach Delay, s/veh					46.4			34.6			108.2	
Approach LOS					D			C			F	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	34.0		32.0		68.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	28.0		26.0		62.0						
Max Q Clear Time (g_c+I1), s	31.5	32.0		26.7		42.2						
Green Ext Time (p_c), s	0.0	0.0		0.0		5.5						

Intersection Summary

HCM 6th Ctrl Delay 62.7

HCM 6th LOS E

Notes

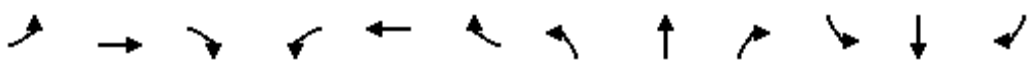
User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	570	0	180	0	0	0	0	1360	200	810	1050	0
Future Volume (vph)	570	0	180	0	0	0	0	1360	200	810	1050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		300	0		0	200		280	0		0
Storage Lanes	1		2	0		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.88	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.950								0.950		
Satd. Flow (prot)	1698	1698	2814	0	0	0	0	5136	1599	1787	3574	0
Flt Permitted	0.950	0.950								0.125		
Satd. Flow (perm)	1698	1698	2814	0	0	0	0	5136	1599	235	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			191						213			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	606	0	191	0	0	0	0	1447	213	862	1117	0
Shared Lane Traffic (%)	50%											
Lane Group Flow (vph)	303	303	191	0	0	0	0	1447	213	862	1117	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			14			18	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

5:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	24.0	24.0	24.0					34.0	34.0	42.0	76.0	
Total Split (%)	24.0%	24.0%	24.0%					34.0%	34.0%	42.0%	76.0%	
Maximum Green (s)	18.0	18.0	18.0					28.0	28.0	38.0	70.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0					-2.0	-2.0	-2.0	-2.0	
Total Lost Time (s)	5.0	5.0	5.0					4.0	4.0	2.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	19.0	19.0	19.0					30.0	30.0	74.0	72.0	
Actuated g/C Ratio	0.19	0.19	0.19					0.30	0.30	0.74	0.72	
v/c Ratio	0.94	0.94	0.28					0.94	0.34	1.09	0.43	
Control Delay	78.7	78.7	6.3					47.1	5.4	59.5	0.3	
Queue Delay	44.5	44.5	0.0					0.0	0.0	5.9	0.4	
Total Delay	123.2	123.2	6.3					47.1	5.4	65.3	0.7	
LOS	F	F	A					D	A	E	A	
Approach Delay		95.2						41.8			28.8	
Approach LOS		F						D			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 1 (1%), Referenced to phase 2:SBTL and 6:NBT, Start of 1st Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 45.6

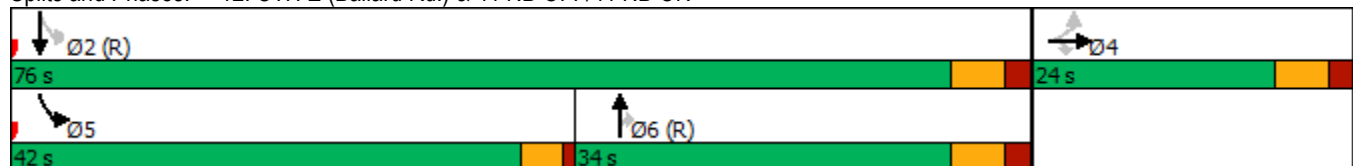
Intersection LOS: D

Intersection Capacity Utilization 106.0%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/21/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	570	0	180	0	0	0	0	1360	200	810	1050	0
Future Volume (veh/h)	570	0	180	0	0	0	0	1360	200	810	1050	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	606	0	191				0	1447	0	862	1117	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	682	0	607				0	1544		800	2579	0
Arrive On Green	0.19	0.00	0.19				0.00	0.30	0.00	0.27	0.48	0.00
Sat Flow, veh/h	3591	0	3195				0	5316	1598	1795	3676	0
Grp Volume(v), veh/h	606	0	191				0	1447	0	862	1117	0
Grp Sat Flow(s),veh/h/ln	1795	0	1598				0	1716	1598	1795	1791	0
Q Serve(g_s), s	16.4	0.0	5.1				0.0	27.4	0.0	40.0	20.4	0.0
Cycle Q Clear(g_c), s	16.4	0.0	5.1				0.0	27.4	0.0	40.0	20.4	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	682	0	607				0	1544		800	2579	0
V/C Ratio(X)	0.89	0.00	0.31				0.00	0.94		1.08	0.43	0.00
Avail Cap(c_a), veh/h	682	0	607				0	1544		800	2579	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.67	0.67	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	0.00	0.09	0.09	0.00
Uniform Delay (d), s/veh	39.5	0.0	34.9				0.0	34.1	0.0	31.7	12.5	0.0
Incr Delay (d2), s/veh	13.9	0.0	0.4				0.0	12.2	0.0	37.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.5	0.0	4.8				0.0	12.8	0.0	27.5	8.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.4	0.0	35.3				0.0	46.2	0.0	69.2	12.6	0.0
LnGrp LOS	D	A	D				A	D		F	B	A
Approach Vol, veh/h	797						1447			1979		
Approach Delay, s/veh	49.0						46.2			37.3		
Approach LOS	D						D			D		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	76.0			24.0			42.0			34.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	70.0			18.0			38.0			28.0		
Max Q Clear Time (g_c+I1), s	22.4			18.4			42.0			29.4		
Green Ext Time (p_c), s	3.7			0.0			0.0			0.0		

Intersection Summary

HCM 6th Ctrl Delay	42.6
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

APPENDIX O15

Year 2048 Build with Long Term Improvements

Synchro AM Peak Hour

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	680	230	150	520	0	0	0	0	200	0	610
Future Volume (vph)	0	680	230	150	520	0	0	0	0	200	0	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	0		0	0		215
Storage Lanes	1		1	1		0	0		0	0		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	3406	1524	1719	1810	0	0	0	0	0	1656	2608
Flt Permitted				0.209							0.950	
Satd. Flow (perm)	0	3406	1524	378	1810	0	0	0	0	0	1656	2608
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			295									405
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	6%	6%	6%	5%	5%	5%	1%	1%	1%	9%	9%	9%
Adj. Flow (vph)	0	872	295	192	667	0	0	0	0	256	0	782
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	872	295	192	667	0	0	0	0	0	256	782
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		38.0	38.0	22.0	60.0					40.0	40.0	40.0
Total Split (%)		38.0%	38.0%	22.0%	60.0%					40.0%	40.0%	40.0%
Maximum Green (s)		31.5	31.5	15.5	53.5					34.0	34.0	34.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		30.3	30.3	46.6	46.6						23.0	23.0
Actuated g/C Ratio		0.39	0.39	0.60	0.60						0.30	0.30
v/c Ratio		0.66	0.38	0.44	0.62						0.52	0.74
Control Delay		24.1	4.4	20.4	14.4						27.7	16.4
Queue Delay		0.0	0.0	0.0	0.5						0.0	0.0
Total Delay		24.1	4.4	20.4	14.8						27.7	16.4
LOS		C	A	C	B						C	B
Approach Delay		19.1			16.1						19.2	
Approach LOS		B			B						B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 77.9

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 18.3

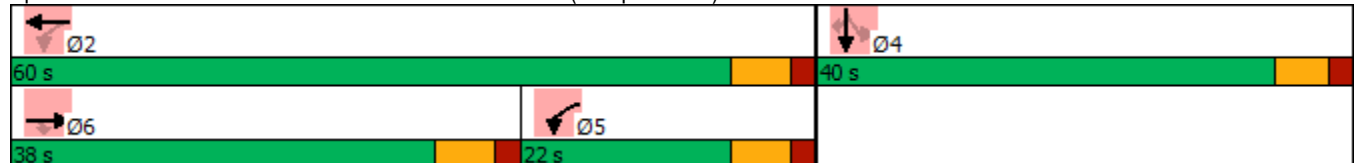
Intersection LOS: B

Intersection Capacity Utilization 74.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

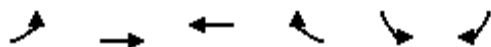
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗	↖	↑						↖	↗
Traffic Volume (veh/h)	0	680	230	150	520	0	0	0	0	200	0	610
Future Volume (veh/h)	0	680	230	150	520	0	0	0	0	200	0	610
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1811	1811	1826	1826	0				1767	1767	1767
Adj Flow Rate, veh/h	0	872	295	192	667	0				256	0	782
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	6	6	5	5	0				9	9	9
Cap, veh/h	0	1229	548	338	963	0				624	0	977
Arrive On Green	0.00	0.36	0.36	0.12	0.53	0.00				0.37	0.00	0.37
Sat Flow, veh/h	0	3532	1535	1739	1826	0				1682	0	2635
Grp Volume(v), veh/h	0	872	295	192	667	0				256	0	782
Grp Sat Flow(s),veh/h/ln	0	1721	1535	1739	1826	0				1682	0	1317
Q Serve(g_s), s	0.0	17.2	12.0	2.0	21.4	0.0				8.9	0.0	20.9
Cycle Q Clear(g_c), s	0.0	17.2	12.0	2.0	21.4	0.0				8.9	0.0	20.9
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1229	548	338	963	0				624	0	977
V/C Ratio(X)	0.00	0.71	0.54	0.57	0.69	0.00				0.41	0.00	0.80
Avail Cap(c_a), veh/h	0	1488	664	528	1300	0				770	0	1206
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	21.8	20.1	30.0	13.8	0.0				18.4	0.0	22.1
Incr Delay (d2), s/veh	0.0	1.5	1.2	1.5	1.4	0.0				0.4	0.0	3.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	6.8	4.3	3.3	8.2	0.0				3.4	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	23.3	21.3	31.6	15.2	0.0				18.8	0.0	25.3
LnGrp LOS	A	C	C	C	B	A				B	A	C
Approach Vol, veh/h		1167			859						1038	
Approach Delay, s/veh		22.8			18.8						23.7	
Approach LOS		C			B						C	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		45.5		33.2	13.4	32.1						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		53.5		34.0	15.5	31.5						
Max Q Clear Time (g_c+I1), s		23.4		22.9	4.0	19.2						
Green Ext Time (p_c), s		5.3		4.3	0.5	6.4						
Intersection Summary												
HCM 6th Ctrl Delay			22.0									
HCM 6th LOS			C									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	580	300	670	110	0	0
Future Volume (vph)	580	300	670	110	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1736	1827	1863	1583	0	0
Flt Permitted	0.132					
Satd. Flow (perm)	241	1827	1863	1583	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				134		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Adj. Flow (vph)	707	366	817	134	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	707	366	817	134	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	5.0	20.0	20.0	20.0		
Minimum Split (s)	20.5	26.5	26.5	26.5		

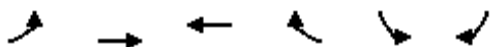
7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	30.0	30.0		
Total Split (%)	38.0%	100.0%	30.0%	30.0%		
Maximum Green (s)	31.5	93.5	23.5	23.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	56.1	60.1	26.3	26.3		
Actuated g/C Ratio	0.93	1.00	0.44	0.44		
v/c Ratio	0.82	0.20	1.00	0.17		
Control Delay	19.2	0.2	54.6	3.7		
Queue Delay	0.3	0.0	0.0	0.0		
Total Delay	19.5	0.2	54.6	3.7		
LOS	B	A	D	A		
Approach Delay		12.9	47.4			
Approach LOS		B	D			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 60.1

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 29.1

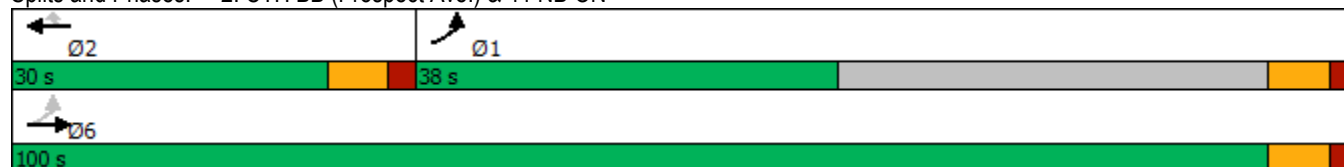
Intersection LOS: C

Intersection Capacity Utilization 74.1%

ICU Level of Service D

Analysis Period (min) 15

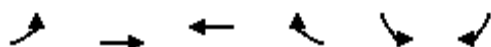
Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	580	300	670	110	0	0
Future Volume (veh/h)	580	300	670	110	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1841	1841	1870	1870		
Adj Flow Rate, veh/h	707	366	817	134		
Peak Hour Factor	0.82	0.82	0.82	0.82		
Percent Heavy Veh, %	4	4	2	2		
Cap, veh/h	843	1713	844	715		
Arrive On Green	0.41	0.93	0.45	0.45		
Sat Flow, veh/h	1753	1841	1870	1585		
Grp Volume(v), veh/h	707	366	817	134		
Grp Sat Flow(s), veh/h/ln	1753	1841	1870	1585		
Q Serve(g_s), s	16.1	1.0	24.5	2.9		
Cycle Q Clear(g_c), s	16.1	1.0	24.5	2.9		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	843	1713	844	715		
V/C Ratio(X)	0.84	0.21	0.97	0.19		
Avail Cap(c_a), veh/h	1160	3068	844	715		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	13.4	0.2	15.4	9.5		
Incr Delay (d2), s/veh	4.1	0.1	23.4	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	6.0	0.0	14.1	0.9		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.4	0.3	38.8	9.6		
LnGrp LOS	B	A	D	A		
Approach Vol, veh/h		1073	951			
Approach Delay, s/veh		11.6	34.7			
Approach LOS		B	C			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	27.6	30.0			57.6	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	23.5			93.5	
Max Q Clear Time (g_c+I1), s	18.1	26.5			3.0	
Green Ext Time (p_c), s	3.0	0.0			2.6	
Intersection Summary						
HCM 6th Ctrl Delay			22.4			
HCM 6th LOS			C			

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	300	0	0	560	220	440
Future Volume (vph)	300	0	0	560	220	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1845	0	0	1881	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1845	0	0	1881	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						473
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	1%	1%	2%	2%
Adj. Flow (vph)	357	0	0	667	262	524
Shared Lane Traffic (%)						
Lane Group Flow (vph)	357	0	0	667	262	524
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Walk Time (s)	5.0			5.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		
Act Effct Green (s)	30.8			30.8	18.5	18.5
Actuated g/C Ratio	0.53			0.53	0.32	0.32
v/c Ratio	0.36			0.67	0.46	0.63
Control Delay	9.6			14.3	20.2	7.0
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.6			14.3	20.2	7.0
LOS	A			B	C	A
Approach Delay	9.6			14.3	11.4	
Approach LOS	A			B	B	
Intersection Summary						
Area Type:	Other					
Cycle Length: 100						
Actuated Cycle Length: 57.8						
Natural Cycle: 50						
Control Type: Actuated-Uncoordinated						
Maximum v/c Ratio: 0.67						
Intersection Signal Delay: 12.1				Intersection LOS: B		
Intersection Capacity Utilization 50.6%				ICU Level of Service A		
Analysis Period (min) 15						

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)

← Ø2	↖ Ø4
59 s	41 s
→ Ø6	
59 s	

HCM 6th Signalized Intersection Summary

3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	300	0	0	560	220	440
Future Volume (veh/h)	300	0	0	560	220	440
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	0	0	1885	1870	1870
Adj Flow Rate, veh/h	357	0	0	667	262	0
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %	3	0	0	1	2	2
Cap, veh/h	983	0	0	999	494	
Arrive On Green	0.53	0.00	0.00	0.53	0.28	0.00
Sat Flow, veh/h	1856	0	0	1885	1781	1585
Grp Volume(v), veh/h	357	0	0	667	262	0
Grp Sat Flow(s),veh/h/ln	1856	0	0	1885	1781	1585
Q Serve(g_s), s	4.6	0.0	0.0	10.7	5.2	0.0
Cycle Q Clear(g_c), s	4.6	0.0	0.0	10.7	5.2	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	983	0	0	999	494	
V/C Ratio(X)	0.36	0.00	0.00	0.67	0.53	
Avail Cap(c_a), veh/h	2458	0	0	2498	1588	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.7	0.0	0.0	7.1	12.7	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	1.1	0.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	2.9	1.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.0	0.0	0.0	8.2	13.6	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	357			667	262	A
Approach Delay, s/veh	6.0			8.2	13.6	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	26.0		15.5		26.0	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	12.7		7.2		6.6	
Green Ext Time (p_c), s	5.5		1.1		2.5	
Intersection Summary						
HCM 6th Ctrl Delay			8.7			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	600	160	300	720	0	0	0	0	240	0	450
Future Volume (vph)	0	600	160	300	720	0	0	0	0	240	0	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0		0	450		450
Storage Lanes	0		1	1		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1770	3539	0	0	0	0	1770	1681	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			186									430
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	698	186	349	837	0	0	0	0	279	0	523
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	698	186	349	837	0	0	0	0	0	279	523
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	R NA	R NA	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	5.0	5.0					7.0	7.0	7.0
Minimum Split (s)		9.0	9.0	10.0	11.0					13.0	13.0	13.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		36.0	36.0	41.0	77.0					23.0	23.0	23.0
Total Split (%)		36.0%	36.0%	41.0%	77.0%					23.0%	23.0%	23.0%
Maximum Green (s)		30.0	30.0	36.0	71.0					17.0	17.0	17.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		32.0	32.0	37.0	73.0					19.0	19.0	19.0
Actuated g/C Ratio		0.32	0.32	0.37	0.73					0.19	0.19	0.19
v/c Ratio		0.43	0.29	0.53	0.32					0.87	0.60	0.60
Control Delay		27.8	5.1	4.5	0.2					67.5	10.5	10.5
Queue Delay		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Delay		27.8	5.1	4.5	0.2					67.5	10.5	10.5
LOS		C	A	A	A					E	B	B
Approach Delay		23.0			1.5					30.3		
Approach LOS		C			A					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 45 (45%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 16.2

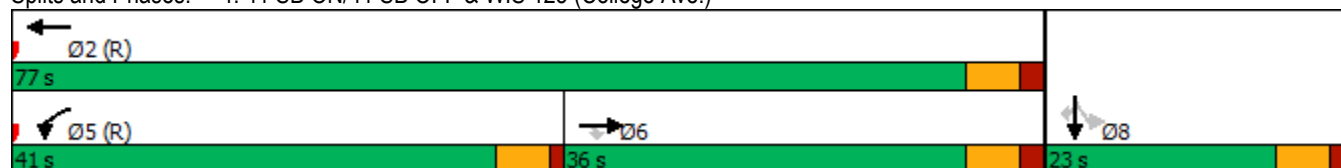
Intersection LOS: B

Intersection Capacity Utilization 45.9%

ICU Level of Service A

Analysis Period (min) 15

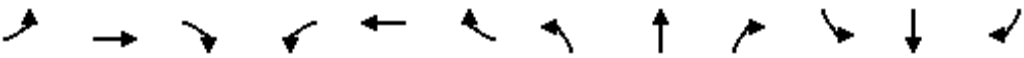
Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↖	↑↑					↘	↖	↗↗
Traffic Volume (veh/h)	0	600	160	300	720	0	0	0	0	240	0	450
Future Volume (veh/h)	0	600	160	300	720	0	0	0	0	240	0	450
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	698	0	349	837	0				279	0	0
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86				0.86	0.86	0.86
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	2347		410	2594	0				677	0	
Arrive On Green	0.00	0.15	0.00	0.23	0.73	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1781	3647	0				3563	0	3170
Grp Volume(v), veh/h	0	698	0	349	837	0				279	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1781	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	12.1	0.0	18.8	8.3	0.0				6.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	12.1	0.0	18.8	8.3	0.0				6.9	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2347		410	2594	0				677	0	
V/C Ratio(X)	0.00	0.30		0.85	0.32	0.00				0.41	0.00	
Avail Cap(c_a), veh/h	0	2347		659	2594	0				677	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.72	0.72	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	28.1	0.0	36.8	4.8	0.0				35.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	4.4	0.2	0.0				1.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	5.6	0.0	8.5	2.6	0.0				3.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	28.4	0.0	41.3	5.0	0.0				37.4	0.0	0.0
LnGrp LOS	A	C		D	A	A				D	A	
Approach Vol, veh/h		698	A		1186						279	A
Approach Delay, s/veh		28.4			15.7						37.4	
Approach LOS		C			B						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		77.0			27.0	50.0		23.0				
Change Period (Y+Rc), s		6.0			5.0	6.0		6.0				
Max Green Setting (Gmax), s		71.0			36.0	30.0		17.0				
Max Q Clear Time (g_c+I1), s		10.3			20.8	14.1		8.9				
Green Ext Time (p_c), s		4.6			1.3	3.1		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			22.6									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	240	600	0	0	680	140	340	0	430	0	0	0
Future Volume (vph)	240	600	0	0	680	140	340	0	430	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.222						0.950					
Satd. Flow (perm)	418	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						163			505			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	279	698	0	0	791	163	395	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	279	698	0	0	791	163	395	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	R NA	R NA	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

7:00 am Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	72.0			37.0	37.0	28.0	28.0	28.0			
Total Split (%)	35.0%	72.0%			37.0%	37.0%	28.0%	28.0%	28.0%			
Maximum Green (s)	29.0	66.0			31.0	31.0	23.0	23.0	23.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	68.0	68.0			33.0	33.0	24.0		24.0			
Actuated g/C Ratio	0.68	0.68			0.33	0.33	0.24		0.24			
v/c Ratio	0.39	0.29			0.47	0.26	0.98		0.48			
Control Delay	2.5	0.2			27.7	5.0	79.4		4.4			
Queue Delay	0.0	0.0			0.0	0.0	0.0		0.0			
Total Delay	2.5	0.2			27.7	5.0	79.4		4.4			
LOS	A	A			C	A	E		A			
Approach Delay	0.9				23.8		37.5					
Approach LOS	A				C		D					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 96 (96%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 20.2

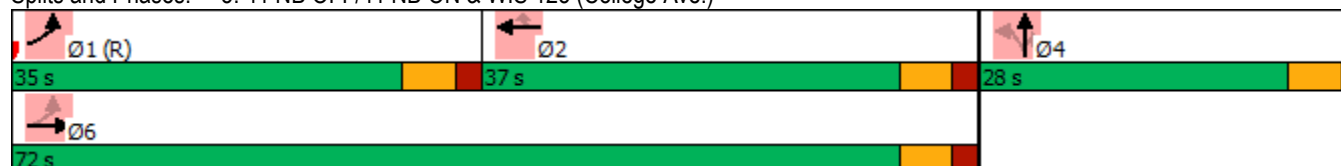
Intersection LOS: C

Intersection Capacity Utilization 45.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  				 			
Traffic Volume (veh/h)	240	600	0	0	680	140	340	0	430	0	0	0
Future Volume (veh/h)	240	600	0	0	680	140	340	0	430	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	279	698	0	0	791	0	395	0	0			
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	639	2436	0	0	2690		855	0				
Arrive On Green	0.11	0.68	0.00	0.00	1.00	0.00	0.24	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	279	698	0	0	791	0	395	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	6.3	7.7	0.0	0.0	0.0	0.0	9.5	0.0	0.0			
Cycle Q Clear(g_c), s	6.3	7.7	0.0	0.0	0.0	0.0	9.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	639	2436	0	0	2690		855	0				
V/C Ratio(X)	0.44	0.29	0.00	0.00	0.29		0.46	0.00				
Avail Cap(c_a), veh/h	992	2436	0	0	2690		855	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00			
Upstream Filter(I)	0.91	0.91	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	6.9	6.4	0.0	0.0	0.0	0.0	32.5	0.0	0.0			
Incr Delay (d2), s/veh	0.4	0.3	0.0	0.0	0.3	0.0	1.8	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.2	2.7	0.0	0.0	0.1	0.0	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.3	6.6	0.0	0.0	0.3	0.0	34.3	0.0	0.0			
LnGrp LOS	A	A	A	A	A		C	A				
Approach Vol, veh/h	977			791			A			395		
Approach Delay, s/veh	6.8			0.3			34.3			A		
Approach LOS	A			A			C					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	15.3	56.7		28.0		72.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	29.0	31.0		23.0		66.0						
Max Q Clear Time (g_c+I1), s	8.3	2.0		11.5		9.7						
Green Ext Time (p_c), s	1.1	4.2		1.4		3.7						

Intersection Summary

HCM 6th Ctrl Delay	9.4
HCM 6th LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↘	↑↑					↖	↗	↘
Traffic Volume (vph)	0	770	300	440	690	0	0	0	0	200	0	380
Future Volume (vph)	0	770	300	440	690	0	0	0	0	200	0	380
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	200		235
Storage Lanes	1		1	2		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.86	1.00	0.97	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	6408	1583	3433	3539	0	0	0	0	1770	1681	2787
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	6408	1583	3433	3539	0	0	0	0	1770	1681	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			385									368
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	987	385	564	885	0	0	0	0	256	0	487
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	987	385	564	885	0	0	0	0	0	256	487
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6							4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		34.0	34.0	40.0	74.0					26.0	26.0	26.0
Total Split (%)		34.0%	34.0%	40.0%	74.0%					26.0%	26.0%	26.0%
Maximum Green (s)		28.0	28.0	36.0	68.0					20.0	20.0	20.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		30.0	30.0	37.7	71.7					20.3	20.3	20.3
Actuated g/C Ratio		0.30	0.30	0.38	0.72					0.20	0.20	0.20
v/c Ratio		0.51	0.52	0.44	0.35					0.75	0.57	0.57
Control Delay		30.1	5.6	17.0	1.5					51.7	11.6	11.6
Queue Delay		0.0	0.0	0.4	0.7					0.0	0.0	0.0
Total Delay		30.1	5.6	17.4	2.2					51.7	11.6	11.6
LOS		C	A	B	A					D	B	B
Approach Delay		23.3			8.1					25.4		
Approach LOS		C			A					C		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 17.5

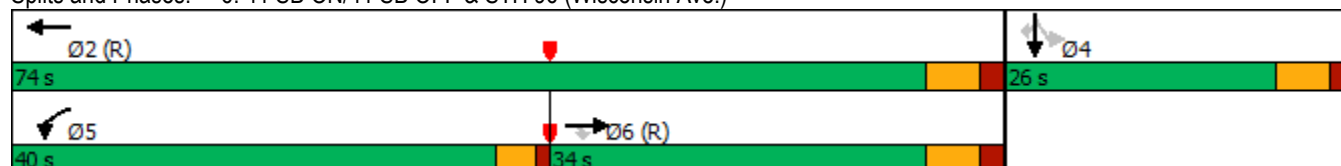
Intersection LOS: B

Intersection Capacity Utilization 49.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↘↗	↑↑					↘	↗	↗↗
Traffic Volume (veh/h)	0	770	300	440	690	0	0	0	0	200	0	380
Future Volume (veh/h)	0	770	300	440	690	0	0	0	0	200	0	380
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	987	0	564	885	0				256	0	487
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	2067		1244	2563	0				708	0	630
Arrive On Green	0.00	0.32	0.00	0.72	1.00	0.00				0.20	0.00	0.20
Sat Flow, veh/h	0	6696	1585	3456	3647	0				3563	0	3170
Grp Volume(v), veh/h	0	987	0	564	885	0				256	0	487
Grp Sat Flow(s),veh/h/ln	0	1609	1585	1728	1777	0				1781	0	1585
Q Serve(g_s), s	0.0	12.3	0.0	6.8	0.0	0.0				6.2	0.0	14.5
Cycle Q Clear(g_c), s	0.0	12.3	0.0	6.8	0.0	0.0				6.2	0.0	14.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2067		1244	2563	0				708	0	630
V/C Ratio(X)	0.00	0.48		0.45	0.35	0.00				0.36	0.00	0.77
Avail Cap(c_a), veh/h	0	2067		1244	2563	0				784	0	697
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.67	0.67	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	27.2	0.0	9.9	0.0	0.0				34.6	0.0	37.9
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.8	0.2	0.0				0.3	0.0	4.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.8	0.0	2.1	0.1	0.0				2.7	0.0	12.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	28.0	0.0	10.7	0.2	0.0				34.9	0.0	42.8
LnGrp LOS	A	C		B	A	A				C	A	D
Approach Vol, veh/h		987	A		1449						743	
Approach Delay, s/veh		28.0			4.3						40.1	
Approach LOS		C			A						D	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		76.1		23.9	40.0	36.1						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		68.0		20.0	36.0	28.0						
Max Q Clear Time (g_c+I1), s		2.0		16.5	8.8	14.3						
Green Ext Time (p_c), s		8.2		1.3	1.7	5.9						
Intersection Summary												
HCM 6th Ctrl Delay			20.0									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	720	0	0	800	80	330	0	390	0	0	0
Future Volume (vph)	250	720	0	0	800	80	330	0	390	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	280		280	0		0
Storage Lanes	2		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.86	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	3433	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Flt Permitted	0.950						0.950					
Satd. Flow (perm)	3433	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						99			365			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	309	889	0	0	988	99	407	0	481	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	309	889	0	0	988	99	407	0	481	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases						2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	40.0	74.0			34.0	34.0	26.0	26.0	26.0			
Total Split (%)	40.0%	74.0%			34.0%	34.0%	26.0%	26.0%	26.0%			
Maximum Green (s)	36.0	68.0			28.0	28.0	20.0	20.0	20.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	36.0	70.0			30.0	30.0	22.0		22.0			
Actuated g/C Ratio	0.36	0.70			0.30	0.30	0.22		0.22			
v/c Ratio	0.25	0.36			0.51	0.18	1.10		0.54			
Control Delay	9.3	3.9			30.1	6.3	115.5		11.1			
Queue Delay	0.0	1.1			0.0	0.0	0.0		0.0			
Total Delay	9.3	5.0			30.1	6.3	115.5		11.1			
LOS	A	A			C	A	F		B			
Approach Delay		6.1			27.9			58.9				
Approach LOS		A			C			E				

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 28.4

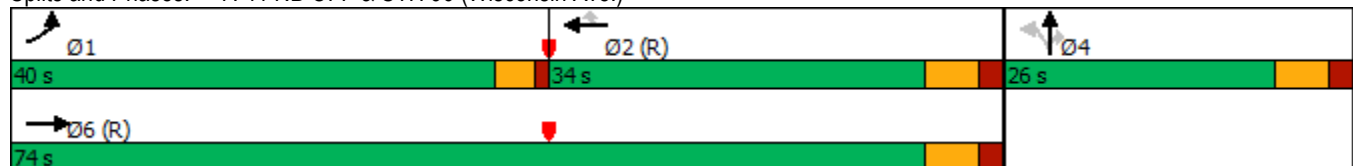
Intersection LOS: C

Intersection Capacity Utilization 49.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

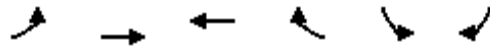
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 				 			
Traffic Volume (veh/h)	250	720	0	0	800	80	330	0	390	0	0	0
Future Volume (veh/h)	250	720	0	0	800	80	330	0	390	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	309	889	0	0	988	99	407	0	481			
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	1244	2560	0	0	2061	508	711	0	633			
Arrive On Green	0.24	0.48	0.00	0.00	0.32	0.32	0.20	0.00	0.20			
Sat Flow, veh/h	3456	3647	0	0	6696	1585	3563	0	3170			
Grp Volume(v), veh/h	309	889	0	0	988	99	407	0	481			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1609	1585	1781	0	1585			
Q Serve(g_s), s	7.2	15.5	0.0	0.0	12.3	4.5	10.3	0.0	14.3			
Cycle Q Clear(g_c), s	7.2	15.5	0.0	0.0	12.3	4.5	10.3	0.0	14.3			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1244	2560	0	0	2061	508	711	0	633			
V/C Ratio(X)	0.25	0.35	0.00	0.00	0.48	0.19	0.57	0.00	0.76			
Avail Cap(c_a), veh/h	1244	2560	0	0	2061	508	784	0	697			
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.85	0.85	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	27.0	11.3	0.0	0.0	27.3	24.6	36.2	0.0	37.8			
Incr Delay (d2), s/veh	0.4	0.3	0.0	0.0	0.8	0.9	0.8	0.0	4.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	3.1	6.8	0.0	0.0	4.8	1.8	4.5	0.0	5.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.4	11.6	0.0	0.0	28.1	25.5	37.0	0.0	42.2			
LnGrp LOS	C	B	A	A	C	C	D	A	D			
Approach Vol, veh/h	1198			1087			888					
Approach Delay, s/veh	15.7			27.8			39.8					
Approach LOS	B			C			D					
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	40.0	36.0	24.0		76.0							
Change Period (Y+Rc), s	4.0	6.0	6.0		6.0							
Max Green Setting (Gmax), s	36.0	28.0	20.0		68.0							
Max Q Clear Time (g_c+I1), s	9.2	14.3	16.3		17.5							
Green Ext Time (p_c), s	0.8	6.4	1.6		8.1							
Intersection Summary												
HCM 6th Ctrl Delay				26.6								
HCM 6th LOS				C								
Notes												

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

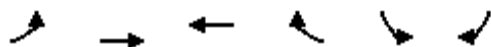
08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰↰	↑↑↑	↑↑↑	↱	↰	↱↱
Traffic Volume (vph)	280	1620	810	440	270	1190
Future Volume (vph)	280	1620	810	440	270	1190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			0	0	375
Storage Lanes	2			1	1	2
Taper Length (ft)	25				25	
Lane Util. Factor	0.97	0.91	0.91	1.00	1.00	0.88
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3426	5085	5036	1568	1770	2787
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3426	5085	5036	1568	1770	2787
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				579		4
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Bus Blockages (#/hr)	1	0	0	0	0	0
Adj. Flow (vph)	368	2132	1066	579	355	1566
Shared Lane Traffic (%)						
Lane Group Flow (vph)	368	2132	1066	579	355	1566
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		24	24		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	NA	Perm	Prot	pm+ov
Protected Phases	1	6	2		4	1
Permitted Phases				2		4
Detector Phase	1	6	2	2	4	1
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	7.0

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Minimum Split (s)	12.0	26.0	26.0	26.0	16.0	12.0
Total Split (s)	27.0	55.0	28.0	28.0	45.0	27.0
Total Split (%)	27.0%	55.0%	28.0%	28.0%	45.0%	27.0%
Maximum Green (s)	22.0	49.0	22.0	22.0	39.0	22.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	3.0
Lead/Lag	Lead		Lag	Lag		Lead
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	3.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	28.8	63.4	30.7	30.7	28.6	62.3
Actuated g/C Ratio	0.29	0.63	0.31	0.31	0.29	0.62
v/c Ratio	0.37	0.66	0.69	0.66	0.70	0.90
Control Delay	29.6	13.8	34.9	6.9	39.1	23.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	13.8	34.9	6.9	39.1	23.8
LOS	C	B	C	A	D	C
Approach Delay		16.1	25.1		26.6	
Approach LOS		B	C		C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 21.9

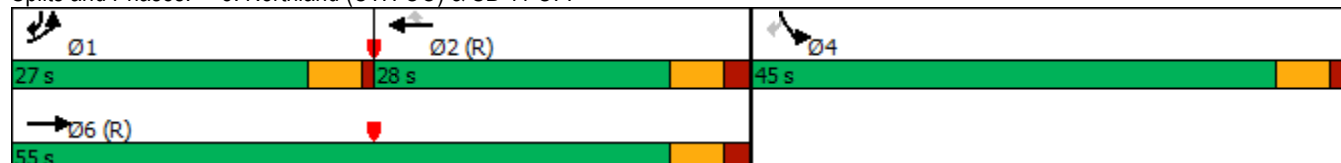
Intersection LOS: C

Intersection Capacity Utilization 65.0%

ICU Level of Service C

Analysis Period (min) 15

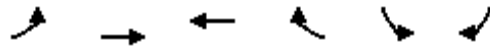
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔↔	↑↑↑	↑↑↑	↔	↔	↔↔
Traffic Volume (veh/h)	280	1620	810	440	270	1190
Future Volume (veh/h)	280	1620	810	440	270	1190
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856	1870	1870
Adj Flow Rate, veh/h	368	2132	1066	0	355	1566
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76
Percent Heavy Veh, %	2	2	3	3	2	2
Cap, veh/h	498	2604	1651		730	1574
Arrive On Green	0.14	0.51	0.33	0.00	0.41	0.41
Sat Flow, veh/h	3456	5274	5233	1572	1781	2790
Grp Volume(v), veh/h	368	2132	1066	0	355	1566
Grp Sat Flow(s),veh/h/ln	1728	1702	1689	1572	1781	1395
Q Serve(g_s), s	10.2	35.1	18.0	0.0	14.7	41.0
Cycle Q Clear(g_c), s	10.2	35.1	18.0	0.0	14.7	41.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	498	2604	1651		730	1574
V/C Ratio(X)	0.74	0.82	0.65		0.49	1.00
Avail Cap(c_a), veh/h	795	2604	1651		730	1574
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.64	0.00	1.00	1.00
Uniform Delay (d), s/veh	41.0	20.6	28.8	0.0	21.7	21.7
Incr Delay (d2), s/veh	2.2	3.0	1.3	0.0	0.7	21.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	13.8	7.3	0.0	6.1	35.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	43.2	23.6	30.0	0.0	22.5	43.1
LnGrp LOS	D	C	C		C	D
Approach Vol, veh/h		2500	1066	A	1921	
Approach Delay, s/veh		26.5	30.0		39.3	
Approach LOS		C	C		D	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	18.4	36.6		45.0		55.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	22.0	22.0		39.0		49.0
Max Q Clear Time (g_c+I1), s	12.2	20.0		43.0		37.1
Green Ext Time (p_c), s	1.2	1.1		0.0		10.1

Intersection Summary

HCM 6th Ctrl Delay	31.7
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑↑↑			↑↑↑	↔	↔	↔	↔			
Traffic Volume (vph)	910	980	0	0	990	180	260	0	480	0	0	0
Future Volume (vph)	910	980	0	0	990	180	260	0	480	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	200		670	0		0
Storage Lanes	2		0	0		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.91	1.00	1.00	0.86	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	3467	5136	0	0	6408	1583	1671	1588	1495	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	3467	5136	0	0	6408	1583	1671	1588	1495	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						237			338			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	8%	8%	8%	1%	1%	1%
Adj. Flow (vph)	1197	1289	0	0	1303	237	342	0	632	0	0	0
Shared Lane Traffic (%)							100%					
Lane Group Flow (vph)	1197	1289	0	0	1303	237	0	342	632	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Split	NA	Free			
Protected Phases	1	6			2		4	4				
Permitted Phases						2			Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				
Minimum Split (s)	12.0	26.0			36.0	36.0	20.0	20.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	36.0	66.0			30.0	30.0	24.0	24.0				
Total Split (%)	40.0%	73.3%			33.3%	33.3%	26.7%	26.7%				
Maximum Green (s)	31.0	60.0			24.0	24.0	18.0	18.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0	-2.0	-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	None	Min			C-Min	C-Min	None	None				
Act Effct Green (s)	32.0	62.0			26.0	26.0		20.0	90.0			
Actuated g/C Ratio	0.36	0.69			0.29	0.29		0.22	1.00			
v/c Ratio	0.97	0.36			0.70	0.38		0.97	0.42			
Control Delay	49.4	6.2			31.0	5.4		78.3	0.9			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	49.4	6.2			31.0	5.4		78.3	0.9			
LOS	D	A			C	A		E	A			
Approach Delay		27.0			27.1			28.1				
Approach LOS		C			C			C				

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:WBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 27.2

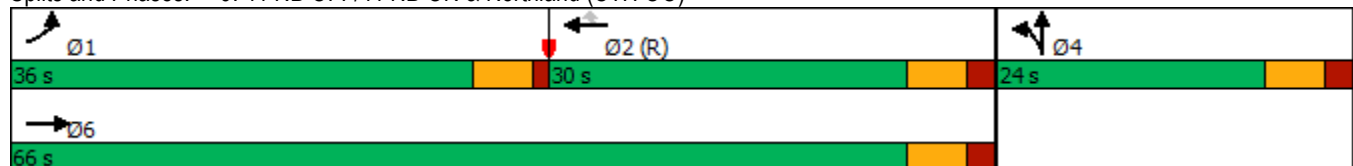
Intersection LOS: C

Intersection Capacity Utilization 61.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary 9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  			  							
Traffic Volume (veh/h)	910	980	0	0	990	180	260	0	480	0	0	0
Future Volume (veh/h)	910	980	0	0	990	180	260	0	480	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1781	1781	1781			
Adj Flow Rate, veh/h	1197	1289	0	0	1303	0	342	0	0			
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76			
Percent Heavy Veh, %	1	1	0	0	2	2	8	8	8			
Cap, veh/h	1238	3898	0	0	2299		522	0				
Arrive On Green	0.36	0.76	0.00	0.00	0.36	0.00	0.15	0.00	0.00			
Sat Flow, veh/h	3483	5316	0	0	6696	1585	3393	0	1510			
Grp Volume(v), veh/h	1197	1289	0	0	1303	0	342	0	0			
Grp Sat Flow(s),veh/h/ln	1742	1716	0	0	1609	1585	1697	0	1510			
Q Serve(g_s), s	30.4	7.3	0.0	0.0	14.7	0.0	8.5	0.0	0.0			
Cycle Q Clear(g_c), s	30.4	7.3	0.0	0.0	14.7	0.0	8.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1238	3898	0	0	2299		522	0				
V/C Ratio(X)	0.97	0.33	0.00	0.00	0.57		0.66	0.00				
Avail Cap(c_a), veh/h	1238	3898	0	0	2299		754	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.69	0.69	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	28.5	3.5	0.0	0.0	23.3	0.0	35.8	0.0	0.0			
Incr Delay (d2), s/veh	14.2	0.0	0.0	0.0	1.0	0.0	2.0	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	14.5	1.8	0.0	0.0	5.5	0.0	3.6	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.6	3.6	0.0	0.0	24.3	0.0	37.8	0.0	0.0			
LnGrp LOS	D	A	A	A	C		D	A				
Approach Vol, veh/h	2486			1303			A			342		
Approach Delay, s/veh	22.4			24.3			37.8			A		
Approach LOS	C			C			D					
Timer - Assigned Phs	1	2	4			6						
Phs Duration (G+Y+Rc), s	36.0	36.2	17.8			72.2						
Change Period (Y+Rc), s	5.0	6.0	6.0			6.0						
Max Green Setting (Gmax), s	31.0	24.0	18.0			60.0						
Max Q Clear Time (g_c+I1), s	32.4	16.7	10.5			9.3						
Green Ext Time (p_c), s	0.0	4.8	1.3			8.3						
Intersection Summary												
HCM 6th Ctrl Delay				24.3								
HCM 6th LOS				C								
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	1.00	1.00	1.00	1.00
Fr t						
Flt Protected						
Satd. Flow (prot)	0	3278	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	3278	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	420	0	170	0	0	0	0	690	490	470	700	0
Future Volume (vph)	420	0	170	0	0	0	0	690	490	470	700	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		400	0		0	300		245	0		0
Storage Lanes	1		1	0		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1698	1787	1599	0	0	0	0	5085	1583	1787	3574	0
Flt Permitted	0.950									0.214		
Satd. Flow (perm)	1698	1787	1599	0	0	0	0	5085	1583	403	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			262						528			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	467	0	189	0	0	0	0	767	544	522	778	0
Shared Lane Traffic (%)	0%											
Lane Group Flow (vph)	467	0	189	0	0	0	0	767	544	522	778	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	R NA	R NA	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)	25.0	25.0	25.0					35.0	35.0	40.0	75.0	
Total Split (%)	25.0%	25.0%	25.0%					35.0%	35.0%	40.0%	75.0%	
Maximum Green (s)	19.0	19.0	19.0					29.0	29.0	36.0	69.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effect Green (s)	21.0		21.0					31.0	31.0	71.0	71.0	
Actuated g/C Ratio	0.21		0.21					0.31	0.31	0.71	0.71	
v/c Ratio	1.31		0.35					0.49	0.64	0.67	0.31	
Control Delay	193.1		2.9					29.3	6.7	8.8	0.2	
Queue Delay	0.0		0.0					0.0	0.0	3.5	0.0	
Total Delay	193.1		2.9					29.3	6.7	12.3	0.2	
LOS	F		A					C	A	B	A	
Approach Delay		138.3						19.9			5.1	
Approach LOS		F						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 37.8

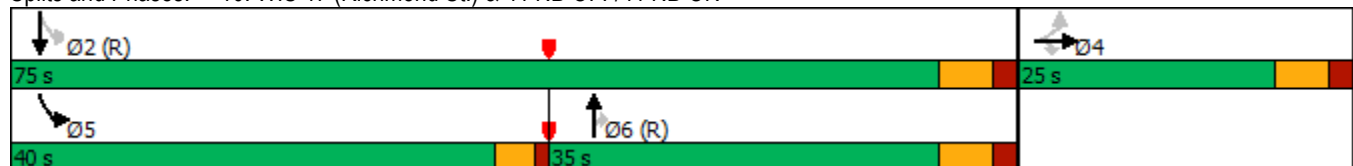
Intersection LOS: D

Intersection Capacity Utilization 89.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	420	0	170	0	0	0	0	690	490	470	700	0
Future Volume (veh/h)	420	0	170	0	0	0	0	690	490	470	700	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	467	0	0				0	767	0	522	778	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1				0	2	2	1	1	0
Cap, veh/h	622	0					0	1770		868	2674	0
Arrive On Green	0.17	0.00	0.00				0.00	0.35	0.00	0.12	0.25	0.00
Sat Flow, veh/h	3591	0	1598				0	5274	1585	1795	3676	0
Grp Volume(v), veh/h	467	0	0				0	767	0	522	778	0
Grp Sat Flow(s),veh/h/ln	1795	0	1598				0	1702	1585	1795	1791	0
Q Serve(g_s), s	12.4	0.0	0.0				0.0	11.5	0.0	14.7	17.6	0.0
Cycle Q Clear(g_c), s	12.4	0.0	0.0				0.0	11.5	0.0	14.7	17.6	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	622	0					0	1770		868	2674	0
V/C Ratio(X)	0.75	0.00					0.00	0.43		0.60	0.29	0.00
Avail Cap(c_a), veh/h	754	0					0	1770		868	2674	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.68	0.68	0.00
Uniform Delay (d), s/veh	39.3	0.0	0.0				0.0	25.1	0.0	16.1	16.2	0.0
Incr Delay (d2), s/veh	3.4	0.0	0.0				0.0	0.8	0.0	2.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.7	0.0	0.0				0.0	4.7	0.0	7.3	8.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.7	0.0	0.0				0.0	25.9	0.0	18.2	16.4	0.0
LnGrp LOS	D	A					A	C		B	B	A
Approach Vol, veh/h	467		A				767		A	1300		
Approach Delay, s/veh	42.7						25.9			17.1		
Approach LOS	D						C			B		
Timer - Assigned Phs	2			4		5	6					
Phs Duration (G+Y+Rc), s	78.7			21.3		40.0	38.7					
Change Period (Y+Rc), s	6.0			6.0		4.0	6.0					
Max Green Setting (Gmax), s	69.0			19.0		36.0	29.0					
Max Q Clear Time (g_c+I1), s	19.6			14.4		16.7	13.5					
Green Ext Time (p_c), s	2.3			1.0		1.3	6.2					
Intersection Summary												
HCM 6th Ctrl Delay	24.5											
HCM 6th LOS	C											
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	320	0	360	480	630	0	0	850	710
Future Volume (vph)	0	0	0	320	0	360	480	630	0	0	850	710
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	400		400	0		0	300		250
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1681	1770	1583	1787	3574	0	0	5085	1583
Flt Permitted				0.950			0.142					
Satd. Flow (perm)	0	0	0	1681	1770	1583	267	3574	0	0	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						262						562
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
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
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	368	0	414	552	724	0	0	977	816
Shared Lane Traffic (%)				0%								
Lane Group Flow (vph)	0	0	0	368	0	414	552	724	0	0	977	816
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	R NA	R NA	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

7:00 am Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	34.0	70.0			36.0	36.0
Total Split (%)				30.0%	30.0%	30.0%	34.0%	70.0%			36.0%	36.0%
Maximum Green (s)				24.0	24.0	24.0	30.0	64.0			30.0	30.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				25.1		25.1	66.9	66.9			32.0	32.0
Actuated g/C Ratio				0.25		0.25	0.67	0.67			0.32	0.32
v/c Ratio				0.87		0.70	0.85	0.30			0.60	0.92
Control Delay				57.9		18.9	22.0	0.3			30.5	27.1
Queue Delay				0.0		0.0	8.8	0.0			0.1	0.0
Total Delay				57.9		18.9	30.8	0.3			30.6	27.1
LOS				E		B	C	A			C	C
Approach Delay					37.3			13.5			29.0	
Approach LOS					D			B			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 48 (48%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 25.5

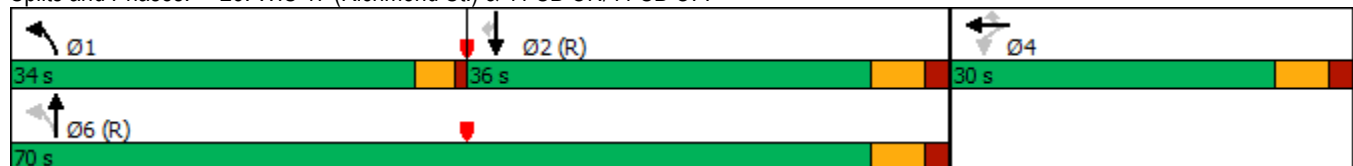
Intersection LOS: C

Intersection Capacity Utilization 89.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↰	↰	↰	↗↗			↗↗↗	↰
Traffic Volume (veh/h)	0	0	0	320	0	360	480	630	0	0	850	710
Future Volume (veh/h)	0	0	0	320	0	360	480	630	0	0	850	710
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				368	0	0	552	724	0	0	977	0
Peak Hour Factor				0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				539	0		769	2753	0	0	2189	
Arrive On Green				0.15	0.00	0.00	0.60	1.00	0.00	0.00	0.43	0.00
Sat Flow, veh/h				3563	0	1585	1795	3676	0	0	5274	1585
Grp Volume(v), veh/h				368	0	0	552	724	0	0	977	0
Grp Sat Flow(s),veh/h/ln				1781	0	1585	1795	1791	0	0	1702	1585
Q Serve(g_s), s				9.8	0.0	0.0	12.4	0.0	0.0	0.0	13.5	0.0
Cycle Q Clear(g_c), s				9.8	0.0	0.0	12.4	0.0	0.0	0.0	13.5	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				539	0		769	2753	0	0	2189	
V/C Ratio(X)				0.68	0.00		0.72	0.26	0.00	0.00	0.45	
Avail Cap(c_a), veh/h				926	0		769	2753	0	0	2189	
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.50	0.50	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				40.2	0.0	0.0	4.6	0.0	0.0	0.0	20.2	0.0
Incr Delay (d2), s/veh				1.5	0.0	0.0	2.9	0.1	0.0	0.0	0.7	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				4.4	0.0	0.0	2.4	0.0	0.0	0.0	5.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				41.7	0.0	0.0	7.5	0.1	0.0	0.0	20.8	0.0
LnGrp LOS				D	A		A	A	A	A	C	
Approach Vol, veh/h					368	A		1276			977	A
Approach Delay, s/veh					41.7			3.3			20.8	
Approach LOS					D			A			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	34.0	46.9		19.1		80.9						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	30.0	30.0		24.0		64.0						
Max Q Clear Time (g_c+I1), s	14.4	15.5		11.8		2.0						
Green Ext Time (p_c), s	1.3	7.6		1.4		2.1						

Intersection Summary

HCM 6th Ctrl Delay 15.2

HCM 6th LOS B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	300	0	940	170	1400	0	0	1180	780
Future Volume (vph)	0	0	0	300	0	940	170	1400	0	0	1180	780
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		300	0		0	450		410
Storage Lanes	0		0	1		2	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	0.97	0.95	1.00	1.00	0.86	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1681	1681	2787	3467	3574	0	0	6408	1583
Flt Permitted				0.950	0.950		0.950					
Satd. Flow (perm)	0	0	0	1681	1681	2787	3467	3574	0	0	6408	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						803
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	361	0	1133	205	1687	0	0	1422	940
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	180	181	1133	205	1687	0	0	1422	940
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	R NA	R NA	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			16	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4						2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				40.0	40.0	40.0	27.0	60.0			33.0	33.0
Total Split (%)				40.0%	40.0%	40.0%	27.0%	60.0%			33.0%	33.0%
Maximum Green (s)				34.0	34.0	34.0	23.0	54.0			27.0	27.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-1.0	-1.0	-1.0	-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)				5.0	5.0	5.0	2.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Min	Min	Min	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				35.0	35.0	35.0	25.0	56.0			29.0	29.0
Actuated g/C Ratio				0.35	0.35	0.35	0.25	0.56			0.29	0.29
v/c Ratio				0.31	0.31	1.11	0.24	0.84			0.77	0.91
Control Delay				25.5	25.5	92.1	8.9	11.9			35.7	20.2
Queue Delay				0.0	0.0	0.0	0.0	23.0			0.0	0.0
Total Delay				25.5	25.5	92.1	8.9	34.9			35.7	20.2
LOS				C	C	F	A	C			D	C
Approach Delay					76.0			32.1			29.5	
Approach LOS					E			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 66 (66%), Referenced to phase 2:SBT and 6:NBT, Start of 1st Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 42.4

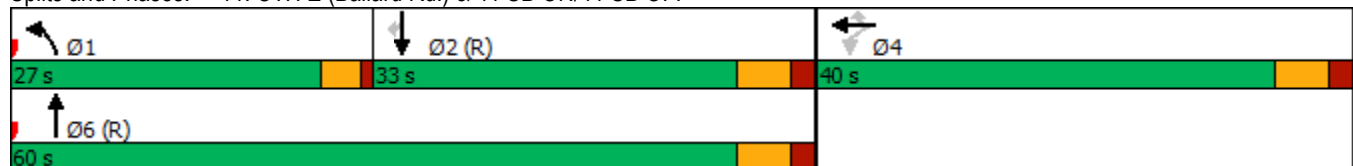
Intersection LOS: D

Intersection Capacity Utilization 81.7%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	300	0	940	170	1400	0	0	1180	780
Future Volume (veh/h)	0	0	0	300	0	940	170	1400	0	0	1180	780
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				361	0	1133	205	1687	0	0	1422	0
Peak Hour Factor				0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				1247	0	1110	871	2006	0	0	1866	
Arrive On Green				0.35	0.00	0.35	0.08	0.18	0.00	0.00	0.29	0.00
Sat Flow, veh/h				3563	0	3170	3483	3676	0	0	6696	1585
Grp Volume(v), veh/h				361	0	1133	205	1687	0	0	1422	0
Grp Sat Flow(s),veh/h/ln				1781	0	1585	1742	1791	0	0	1609	1585
Q Serve(g_s), s				7.3	0.0	35.0	5.5	45.5	0.0	0.0	20.1	0.0
Cycle Q Clear(g_c), s				7.3	0.0	35.0	5.5	45.5	0.0	0.0	20.1	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1247	0	1110	871	2006	0	0	1866	
V/C Ratio(X)				0.29	0.00	1.02	0.24	0.84	0.00	0.00	0.76	
Avail Cap(c_a), veh/h				1247	0	1110	871	2006	0	0	1866	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.63	0.63	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				23.5	0.0	32.5	36.9	36.5	0.0	0.0	32.4	0.0
Incr Delay (d2), s/veh				0.2	0.0	32.5	0.4	2.9	0.0	0.0	3.0	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.1	0.0	17.9	2.5	22.5	0.0	0.0	8.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				23.7	0.0	65.0	37.3	39.3	0.0	0.0	35.4	0.0
LnGrp LOS				C	A	F	D	D	A	A	D	
Approach Vol, veh/h					1494			1892			1422	A
Approach Delay, s/veh					55.0			39.1			35.4	
Approach LOS					D			D			D	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	27.0	33.0		40.0		60.0						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	23.0	27.0		34.0		54.0						
Max Q Clear Time (g_c+I1), s	7.5	22.1		37.0		47.5						
Green Ext Time (p_c), s	0.5	3.6		0.0		3.4						

Intersection Summary

HCM 6th Ctrl Delay 42.9

HCM 6th LOS D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	770	0	410	0	0	0	0	800	280	1130	350	0
Future Volume (vph)	770	0	410	0	0	0	0	800	280	1130	350	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		300	0		0	200		280	0		0
Storage Lanes	1		2	0		0	1		1	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.88	1.00	1.00	1.00	1.00	0.86	1.00	0.97	0.95	1.00
Frt			0.850							0.850		
Flt Protected	0.950	0.950								0.950		
Satd. Flow (prot)	1681	1681	2787	0	0	0	0	6471	1599	3467	3574	0
Flt Permitted	0.950	0.950								0.950		
Satd. Flow (perm)	1681	1681	2787	0	0	0	0	6471	1599	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			466						318			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	875	0	466	0	0	0	0	909	318	1284	398	0
Shared Lane Traffic (%)	50%											
Lane Group Flow (vph)	437	438	466	0	0	0	0	909	318	1284	398	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	R NA	R NA	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			16			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	Prot	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6			
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	35.0	35.0	35.0					26.0	26.0	39.0	65.0	
Total Split (%)	35.0%	35.0%	35.0%					26.0%	26.0%	39.0%	65.0%	
Maximum Green (s)	29.0	29.0	29.0					20.0	20.0	35.0	59.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0					-2.0	-2.0	-2.0	-2.0	
Total Lost Time (s)	5.0	5.0	5.0					4.0	4.0	2.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	29.6	29.6	29.6					22.0	22.0	37.4	61.4	
Actuated g/C Ratio	0.30	0.30	0.30					0.22	0.22	0.37	0.61	
v/c Ratio	0.88	0.88	0.40					0.64	0.53	0.99	0.18	
Control Delay	54.1	54.4	3.7					37.8	7.4	28.5	2.4	
Queue Delay	5.9	6.0	0.0					0.0	0.0	0.0	0.0	
Total Delay	59.9	60.4	3.7					37.8	7.4	28.5	2.4	
LOS	E	E	A					D	A	C	A	
Approach Delay		40.5						29.9			22.3	
Approach LOS		D						C			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 4 (4%), Referenced to phase 2:SBT and 6:NBT, Start of 1st Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 30.3

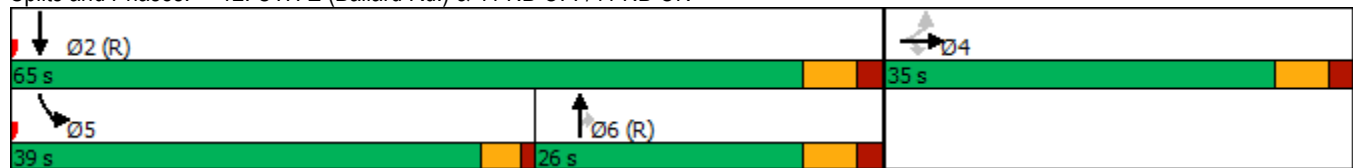
Intersection LOS: C

Intersection Capacity Utilization 81.7%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								  			 	
Traffic Volume (veh/h)	770	0	410	0	0	0	0	800	280	1130	350	0
Future Volume (veh/h)	770	0	410	0	0	0	0	800	280	1130	350	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	875	0	466				0	909	0	1284	398	0
Peak Hour Factor	0.88	0.88	0.88				0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	2				0	1	1	1	1	0
Cap, veh/h	1032	0	919				0	1493		1289	2221	0
Arrive On Green	0.29	0.00	0.29				0.00	0.23	0.00	0.12	0.20	0.00
Sat Flow, veh/h	3563	0	3170				0	6749	1598	3483	3676	0
Grp Volume(v), veh/h	875	0	466				0	909	0	1284	398	0
Grp Sat Flow(s),veh/h/ln	1781	0	1585				0	1621	1598	1742	1791	0
Q Serve(g_s), s	23.1	0.0	12.2				0.0	12.5	0.0	36.8	9.2	0.0
Cycle Q Clear(g_c), s	23.1	0.0	12.2				0.0	12.5	0.0	36.8	9.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1032	0	919				0	1493		1289	2221	0
V/C Ratio(X)	0.85	0.00	0.51				0.00	0.61		1.00	0.18	0.00
Avail Cap(c_a), veh/h	1069	0	951				0	1493		1289	2221	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	0.00	0.63	0.63	0.00
Uniform Delay (d), s/veh	33.4	0.0	29.6				0.0	34.5	0.0	43.8	18.8	0.0
Incr Delay (d2), s/veh	6.6	0.0	0.6				0.0	1.9	0.0	19.1	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.7	0.0	11.1				0.0	5.1	0.0	20.5	4.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.0	0.0	30.2				0.0	36.3	0.0	62.9	18.9	0.0
LnGrp LOS	D	A	C				A	D		E	B	A
Approach Vol, veh/h	1341						909			A		
Approach Delay, s/veh	36.6						36.3			52.5		
Approach LOS	D						D			D		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	66.0			34.0			39.0			27.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	59.0			29.0			35.0			20.0		
Max Q Clear Time (g_c+l1), s	11.2			25.1			38.8			14.5		
Green Ext Time (p_c), s	1.1			2.9			0.0			2.8		
Intersection Summary												
HCM 6th Ctrl Delay	43.3											
HCM 6th LOS	D											
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↗	↗	↗		↗	↗
Traffic Volume (vph)	0	0	0	190	0	110	340	380	0	0	250	450
Future Volume (vph)	0	0	0	190	0	110	340	380	0	0	250	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3505	1568
Flt Permitted					0.950		0.579					
Satd. Flow (perm)	0	0	0	0	1787	1599	1089	3574	0	0	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						124						506
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	0	0	213	0	124	382	427	0	0	281	506
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	213	124	382	427	0	0	281	506
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				30.0	30.0	30.0	35.0	75.0			40.0	40.0
Total Split (%)				28.6%	28.6%	28.6%	33.3%	71.4%			38.1%	38.1%
Maximum Green (s)				24.0	24.0	24.0	28.5	68.5			33.5	33.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					14.7	14.7	37.9	37.9			22.9	22.9
Actuated g/C Ratio					0.24	0.24	0.62	0.62			0.38	0.38
v/c Ratio					0.49	0.26	0.47	0.19			0.21	0.56
Control Delay					24.1	5.7	9.9	5.5			14.0	4.5
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					24.1	5.7	9.9	5.5			14.0	4.5
LOS					C	A	A	A			B	A
Approach Delay					17.3			7.6			7.9	
Approach LOS					B			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 60.7

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 9.4

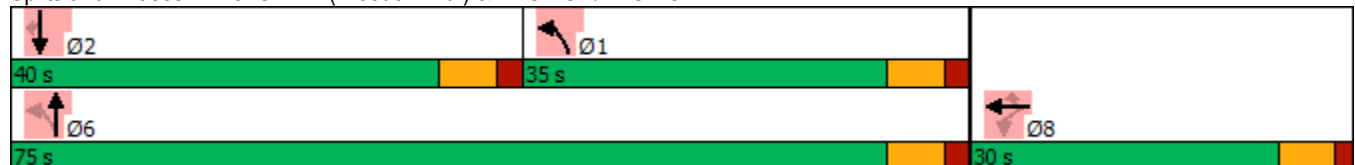
Intersection LOS: A

Intersection Capacity Utilization 67.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↷	↶	↷			↷	↷
Traffic Volume (veh/h)	0	0	0	190	0	110	340	380	0	0	250	450
Future Volume (veh/h)	0	0	0	190	0	110	340	380	0	0	250	450
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1856	1856
Adj Flow Rate, veh/h				213	0	0	382	427	0	0	281	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	3	3
Cap, veh/h				369	0		754	2339	0	0	1400	
Arrive On Green				0.21	0.00	0.00	0.19	0.65	0.00	0.00	0.40	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3618	1572
Grp Volume(v), veh/h				213	0	0	382	427	0	0	281	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1763	1572
Q Serve(g_s), s				6.1	0.0	0.0	0.0	2.7	0.0	0.0	3.0	0.0
Cycle Q Clear(g_c), s				6.1	0.0	0.0	0.0	2.7	0.0	0.0	3.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				369	0		754	2339	0	0	1400	
V/C Ratio(X)				0.58	0.00		0.51	0.18	0.00	0.00	0.20	
Avail Cap(c_a), veh/h				824	0		1403	4489	0	0	2240	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				20.3	0.0	0.0	13.0	3.9	0.0	0.0	11.2	0.0
Incr Delay (d2), s/veh				1.4	0.0	0.0	0.8	0.0	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				2.5	0.0	0.0	3.5	0.6	0.0	0.0	1.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				21.7	0.0	0.0	13.8	3.9	0.0	0.0	11.3	0.0
LnGrp LOS				C	A		B	A	A	A	B	
Approach Vol, veh/h					213	A		809			281	A
Approach Delay, s/veh					21.7			8.6			11.3	
Approach LOS					C			A			B	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	14.5	26.5				41.0		15.6				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	28.5	33.5				68.5		24.0				
Max Q Clear Time (g_c+I1), s	2.0	5.0				4.7		8.1				
Green Ext Time (p_c), s	2.6	1.9				2.1		0.7				

Intersection Summary

HCM 6th Ctrl Delay	11.3
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↶	↷					↶	↷	↶	↷	
Traffic Volume (vph)	180	0	180	0	0	0	0	540	260	150	290	0
Future Volume (vph)	180	0	180	0	0	0	0	540	260	150	290	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1736	1553	0	0	0	0	3471	1553	1736	3471	0
Flt Permitted		0.950								0.370		
Satd. Flow (perm)	0	1736	1553	0	0	0	0	3471	1553	676	3471	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196						191			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
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 (%)	4%	4%	4%	1%	1%	1%	4%	4%	4%	4%	4%	4%
Adj. Flow (vph)	196	0	196	0	0	0	0	587	283	163	315	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	196	196	0	0	0	0	587	283	163	315	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

7:00 am Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	20.0	20.0	20.0					40.0	40.0	45.0	85.0	
Total Split (%)	19.0%	19.0%	19.0%					38.1%	38.1%	42.9%	81.0%	
Maximum Green (s)	14.0	14.0	14.0					33.5	33.5	38.5	78.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effct Green (s)		14.7	14.7					22.7	22.7	37.3	37.3	
Actuated g/C Ratio		0.24	0.24					0.38	0.38	0.62	0.62	
v/c Ratio		0.46	0.37					0.45	0.40	0.27	0.15	
Control Delay		23.4	5.7					15.6	7.1	7.8	5.1	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		23.4	5.7					15.6	7.1	7.8	5.1	
LOS		C	A					B	A	A	A	
Approach Delay		14.6						12.8			6.0	
Approach LOS		B						B			A	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 60

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 11.4

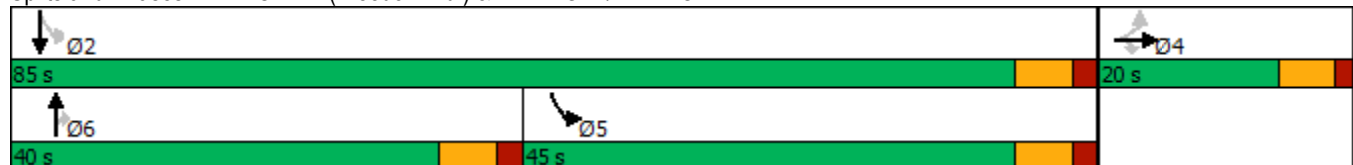
Intersection LOS: B

Intersection Capacity Utilization 67.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	0	180	0	0	0	0	540	260	150	290	0
Future Volume (veh/h)	180	0	180	0	0	0	0	540	260	150	290	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1841	1841	1841				0	1841	1841	1841	1841	0
Adj Flow Rate, veh/h	196	0	0				0	587	0	163	315	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4				0	4	4	4	4	0
Cap, veh/h	358	0					0	1392		613	2289	0
Arrive On Green	0.20	0.00	0.00				0.00	0.40	0.00	0.19	0.65	0.00
Sat Flow, veh/h	1753	0	1560				0	3589	1560	1753	3589	0
Grp Volume(v), veh/h	196	0	0				0	587	0	163	315	0
Grp Sat Flow(s),veh/h/ln	1753	0	1560				0	1749	1560	1753	1749	0
Q Serve(g_s), s	5.7	0.0	0.0				0.0	6.9	0.0	0.0	1.9	0.0
Cycle Q Clear(g_c), s	5.7	0.0	0.0				0.0	6.9	0.0	0.0	1.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	358	0					0	1392		613	2289	0
V/C Ratio(X)	0.55	0.00					0.00	0.42		0.27	0.14	0.00
Avail Cap(c_a), veh/h	496	0					0	2227		1559	5011	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.2	0.0	0.0				0.0	12.3	0.0	13.5	3.7	0.0
Incr Delay (d2), s/veh	1.9	0.0	0.0				0.0	0.2	0.0	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.0	0.0				0.0	2.4	0.0	1.4	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.0	0.0	0.0				0.0	12.5	0.0	13.8	3.7	0.0
LnGrp LOS	C	A					A	B		B	A	A
Approach Vol, veh/h		196	A					587	A		478	
Approach Delay, s/veh		22.0						12.5			7.2	
Approach LOS		C						B			A	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		41.0		15.5	14.5	26.5						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		78.5		14.0	38.5	33.5						
Max Q Clear Time (g_c+I1), s		3.9		7.7	2.0	8.9						
Green Ext Time (p_c), s		1.5		0.5	1.0	2.8						
Intersection Summary												
HCM 6th Ctrl Delay			12.0									
HCM 6th LOS			B									
Notes												

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	160	0	120	100	110	0	0	380	90
Future Volume (vph)	0	0	0	160	0	120	100	110	0	0	380	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Frt						0.850						0.971
Flt Protected					0.950				0.950			
Satd. Flow (prot)	0	0	0	0	1770	1583	1787	1881	0	0	3437	0
Flt Permitted					0.950				0.950			
Satd. Flow (perm)	0	0	0	0	1770	1583	1787	1881	0	0	3437	0
Link Speed (mph)	30				30				30			
Link Distance (ft)	1011				1061				775			
Travel Time (s)	23.0				24.1				17.6			
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
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	188	0	141	118	129	0	0	447	106
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	188	141	118	129	0	0	553	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0				0				12			
Link Offset(ft)	0				0				0			
Crosswalk Width(ft)	16				16				16			
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control	Stop				Stop				Free			
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	37.8%				ICU Level of Service A							
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	5.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↔	↔	↔	↔			↔	
Traffic Vol, veh/h	0	0	0	160	0	120	100	110	0	0	380	90
Future Vol, veh/h	0	0	0	160	0	120	100	110	0	0	380	90
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	0	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	2	2	2	1	1	1	2	2	2
Mvmt Flow	0	0	0	188	0	141	118	129	0	0	447	106

Major/Minor	Minor1	Major1	Major2									
Conflicting Flow All	589	918	129	553	0	-	-	-	-	0		
Stage 1	365	365	-	-	-	-	-	-	-	-		
Stage 2	224	553	-	-	-	-	-	-	-	-		
Critical Hdwy	6.63	6.53	6.23	4.115	-	-	-	-	-	-		
Critical Hdwy Stg 1	5.43	5.53	-	-	-	-	-	-	-	-		
Critical Hdwy Stg 2	5.83	5.53	-	-	-	-	-	-	-	-		
Follow-up Hdwy	3.519	4.019	3.319	2.2095	-	-	-	-	-	-		
Pot Cap-1 Maneuver	455	271	920	1021	-	0	0	-	-	-		
Stage 1	701	623	-	-	-	0	0	-	-	-		
Stage 2	793	513	-	-	-	0	0	-	-	-		
Platoon blocked, %					-			-		-		
Mov Cap-1 Maneuver	402	0	920	1021	-	-	-	-	-	-		
Mov Cap-2 Maneuver	402	0	-	-	-	-	-	-	-	-		
Stage 1	620	0	-	-	-	-	-	-	-	-		
Stage 2	793	0	-	-	-	-	-	-	-	-		

Approach	WB	NB	SB
HCM Control Delay, s	16.5	4.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBTWBLn1WBLn2	SBT	SBR
Capacity (veh/h)	1021	- 402 920	-	-
HCM Lane V/C Ratio	0.115	- 0.468 0.153	-	-
HCM Control Delay (s)	9	- 21.6 9.6	-	-
HCM Lane LOS	A	- C A	-	-
HCM 95th %tile Q(veh)	0.4	- 2.4 0.5	-	-

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	0	90	0	0	0	0	150	420	110	430	0
Future Volume (vph)	60	0	90	0	0	0	0	150	420	110	430	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850					0.889				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1719	1538	0	0	0	0	3146	0	1787	1881	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1719	1538	0	0	0	0	3146	0	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	5%	5%	5%	5%	5%	5%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	68	0	102	0	0	0	0	170	477	125	489	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	68	102	0	0	0	0	647	0	125	489	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	37.8%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection

Int Delay, s/veh 2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱					↰↱		↱	↰	
Traffic Vol, veh/h	60	0	90	0	0	0	0	150	420	110	430	0
Future Vol, veh/h	60	0	90	0	0	0	0	150	420	110	430	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	2	2	2	1	1	1
Mvmt Flow	68	0	102	0	0	0	0	170	477	125	489	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	824	1386	489	-	0	0	647	0	0
Stage 1	739	739	-	-	-	-	-	-	-
Stage 2	85	647	-	-	-	-	-	-	-
Critical Hdwy	6.675	6.575	6.275	-	-	-	4.115	-	-
Critical Hdwy Stg 1	5.475	5.575	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.875	5.575	-	-	-	-	-	-	-
Follow-up Hdwy	3.5475	4.0475	3.3475	-	-	-	2.2095	-	-
Pot Cap-1 Maneuver	322	140	571	0	-	-	942	-	0
Stage 1	464	417	-	0	-	-	-	-	0
Stage 2	921	460	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	279	0	571	-	-	-	942	-	-
Mov Cap-2 Maneuver	279	0	-	-	-	-	-	-	-
Stage 1	402	0	-	-	-	-	-	-	-
Stage 2	921	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.4	0	1.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	279	571	942	-
HCM Lane V/C Ratio	-	-	0.244	0.179	0.133	-
HCM Control Delay (s)	-	-	22	12.7	9.4	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0.6	0.5	-

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	400	100	240	210	0	0	0	0	120	0	120
Future Volume (vph)	0	400	100	240	210	0	0	0	0	120	0	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		250
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.470							0.950	
Satd. Flow (perm)	0	1863	1583	884	1881	0	0	0	0	0	1770	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			118									141
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	471	118	282	247	0	0	0	0	141	0	141
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	471	118	282	247	0	0	0	0	0	141	141
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Perm	NA					Perm	NA	Perm
Protected Phases		6			2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	2	2					4	4	4
Switch Phase												
Minimum Initial (s)		10.0	10.0	10.0	10.0					10.0	10.0	10.0
Minimum Split (s)		16.0	16.0	16.0	16.0					16.0	16.0	16.0

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		36.0	36.0	36.0	36.0					24.0	24.0	24.0
Total Split (%)		60.0%	60.0%	60.0%	60.0%					40.0%	40.0%	40.0%
Maximum Green (s)		30.0	30.0	30.0	30.0					18.0	18.0	18.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0						0.0	0.0
Total Lost Time (s)		6.0	6.0	6.0	6.0						6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	3.0
Recall Mode		Min	Min	Min	Min					None	None	None
Act Effect Green (s)		26.3	26.3	26.3	26.3						11.1	11.1
Actuated g/C Ratio		0.60	0.60	0.60	0.60						0.25	0.25
v/c Ratio		0.42	0.12	0.53	0.22						0.32	0.28
Control Delay		8.5	1.9	12.7	6.9						18.4	5.8
Queue Delay		0.0	0.0	0.0	0.0						0.0	0.0
Total Delay		8.5	1.9	12.7	6.9						18.4	5.8
LOS		A	A	B	A						B	A
Approach Delay		7.1			10.0						12.1	
Approach LOS		A			A						B	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 43.7

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.53

Intersection Signal Delay: 9.2

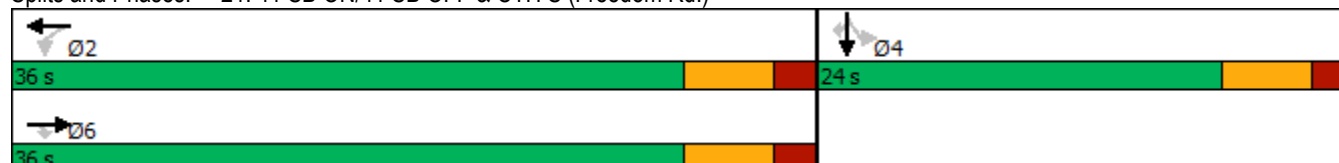
Intersection LOS: A

Intersection Capacity Utilization 62.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)



HCM 6th Signalized Intersection Summary
 21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (veh/h)	0	400	100	240	210	0	0	0	0	120	0	120
Future Volume (veh/h)	0	400	100	240	210	0	0	0	0	120	0	120
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1870	1870	1870
Adj Flow Rate, veh/h	0	471	118	282	247	0				141	0	141
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85				0.85	0.85	0.85
Percent Heavy Veh, %	0	2	2	1	1	0				2	2	2
Cap, veh/h	0	1014	859	475	1022	0				366	0	325
Arrive On Green	0.00	0.54	0.54	0.54	0.54	0.00				0.21	0.00	0.21
Sat Flow, veh/h	0	1870	1585	834	1885	0				1781	0	1585
Grp Volume(v), veh/h	0	471	118	282	247	0				141	0	141
Grp Sat Flow(s),veh/h/ln	0	1870	1585	834	1885	0				1781	0	1585
Q Serve(g_s), s	0.0	7.3	1.8	14.9	3.3	0.0				3.2	0.0	3.7
Cycle Q Clear(g_c), s	0.0	7.3	1.8	22.2	3.3	0.0				3.2	0.0	3.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1014	859	475	1022	0				366	0	325
V/C Ratio(X)	0.00	0.46	0.14	0.59	0.24	0.00				0.39	0.00	0.43
Avail Cap(c_a), veh/h	0	1181	1001	549	1190	0				675	0	600
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	6.7	5.4	13.4	5.7	0.0				16.3	0.0	16.5
Incr Delay (d2), s/veh	0.0	0.3	0.1	1.3	0.1	0.0				0.7	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.1	0.4	2.4	0.9	0.0				1.2	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	7.0	5.5	14.7	5.9	0.0				17.0	0.0	17.4
LnGrp LOS	A	A	A	B	A	A				B	A	B
Approach Vol, veh/h		589			529						282	
Approach Delay, s/veh		6.7			10.6						17.2	
Approach LOS		A			B						B	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		31.8		15.8		31.8						
Change Period (Y+Rc), s		6.0		6.0		6.0						
Max Green Setting (Gmax), s		30.0		18.0		30.0						
Max Q Clear Time (g_c+I1), s		24.2		5.7		9.3						
Green Ext Time (p_c), s		1.6		0.9		2.5						
Intersection Summary												
HCM 6th Ctrl Delay				10.3								
HCM 6th LOS				B								

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	200	0	0	400	210	50	0	170	0	0	0
Future Volume (vph)	320	200	0	0	400	210	50	0	170	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		250	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.488							0.950				
Satd. Flow (perm)	918	1881	0	0	1863	1583	0	1719	1538	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						239			193			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	364	227	0	0	455	239	57	0	193	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	364	227	0	0	455	239	0	57	193	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Perm	NA			NA	Perm	Perm	NA	Perm			
Protected Phases		6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	6	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	10.0	10.0			10.0	10.0	10.0	10.0	10.0			
Minimum Split (s)	16.0	16.0			16.0	16.0	16.0	16.0	16.0			

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	42.0	42.0			42.0	42.0	18.0	18.0	18.0			
Total Split (%)	70.0%	70.0%			70.0%	70.0%	30.0%	30.0%	30.0%			
Maximum Green (s)	36.0	36.0			36.0	36.0	12.0	12.0	12.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0	0.0			
Total Lost Time (s)	6.0	6.0			6.0	6.0		6.0	6.0			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	Min	Min			Min	Min	None	None	None			
Act Effct Green (s)	29.1	29.1			29.1	29.1		10.6	10.6			
Actuated g/C Ratio	0.63	0.63			0.63	0.63		0.23	0.23			
v/c Ratio	0.63	0.19			0.39	0.22		0.14	0.38			
Control Delay	14.1	5.9			7.3	1.4		19.1	6.7			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	14.1	5.9			7.3	1.4		19.1	6.7			
LOS	B	A			A	A		B	A			
Approach Delay		10.9			5.3			9.5				
Approach LOS		B			A			A				

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 46.1

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 8.1

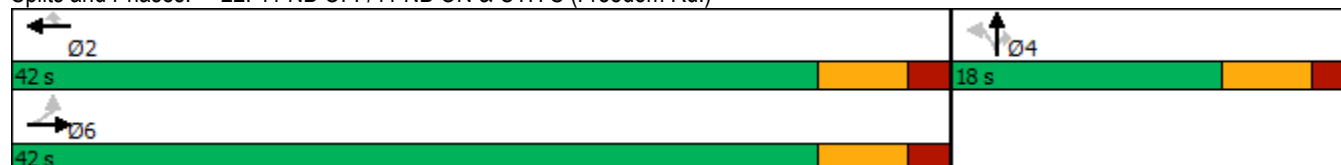
Intersection LOS: A

Intersection Capacity Utilization 62.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)



HCM 6th Signalized Intersection Summary
 22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	320	200	0	0	400	210	50	0	170	0	0	0
Future Volume (veh/h)	320	200	0	0	400	210	50	0	170	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1826	1826	1826			
Adj Flow Rate, veh/h	364	227	0	0	455	239	57	0	193			
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88			
Percent Heavy Veh, %	1	1	0	0	2	2	5	5	5			
Cap, veh/h	503	1172	0	0	1163	986	296	0	263			
Arrive On Green	0.62	0.62	0.00	0.00	0.62	0.62	0.17	0.00	0.17			
Sat Flow, veh/h	756	1885	0	0	1870	1585	1739	0	1547			
Grp Volume(v), veh/h	364	227	0	0	455	239	57	0	193			
Grp Sat Flow(s),veh/h/ln	756	1885	0	0	1870	1585	1739	0	1547			
Q Serve(g_s), s	26.8	3.0	0.0	0.0	7.0	3.9	1.6	0.0	6.8			
Cycle Q Clear(g_c), s	33.8	3.0	0.0	0.0	7.0	3.9	1.6	0.0	6.8			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	503	1172	0	0	1163	986	296	0	263			
V/C Ratio(X)	0.72	0.19	0.00	0.00	0.39	0.24	0.19	0.00	0.73			
Avail Cap(c_a), veh/h	505	1176	0	0	1167	989	362	0	322			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	13.9	4.7	0.0	0.0	5.5	4.9	20.5	0.0	22.7			
Incr Delay (d2), s/veh	5.1	0.1	0.0	0.0	0.2	0.1	0.3	0.0	6.6			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.3	0.8	0.0	0.0	2.0	0.9	0.6	0.0	2.8			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.0	4.8	0.0	0.0	5.7	5.0	20.8	0.0	29.3			
LnGrp LOS	B	A	A	A	A	A	C	A	C			
Approach Vol, veh/h	591			694			250					
Approach Delay, s/veh	13.5			5.4			27.4					
Approach LOS	B			A			C					
Timer - Assigned Phs	2			4			6					
Phs Duration (G+Y+Rc), s	41.9			15.8			41.9					
Change Period (Y+Rc), s	6.0			6.0			6.0					
Max Green Setting (Gmax), s	36.0			12.0			36.0					
Max Q Clear Time (g_c+I1), s	9.0			8.8			35.8					
Green Ext Time (p_c), s	3.2			0.3			0.1					
Intersection Summary												
HCM 6th Ctrl Delay				12.1								
HCM 6th LOS				B								

APPENDIX O16

Year 2048 Build with Long Term Improvements

Synchro PM Peak Hour

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (vph)	410	0	0	720	210	400
Future Volume (vph)	410	0	0	720	210	400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	0		100	0
Storage Lanes		0	0		1	1
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	0	0	1845	1770	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	0	0	1845	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						351
Link Speed (mph)	30			30	30	
Link Distance (ft)	560			456	1100	
Travel Time (s)	12.7			10.4	25.0	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	3%	3%	2%	2%
Adj. Flow (vph)	482	0	0	847	247	471
Shared Lane Traffic (%)						
Lane Group Flow (vph)	482	0	0	847	247	471
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	1			1	1	1
Detector Template						
Leading Detector (ft)	50			50	50	50
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	50			50	50	50
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	20.0			20.0	10.0	10.0
Minimum Split (s)	26.0			26.0	16.0	16.0

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	1040	440	320	400	0	0	0	0	240	0	410
Future Volume (vph)	0	1040	440	320	400	0	0	0	0	240	0	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		0	0		0	0		0	0		215
Storage Lanes	1		1	1		0	0		0	0		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	3471	1553	1719	1810	0	0	0	0	0	1787	2814
Flt Permitted				0.100							0.950	
Satd. Flow (perm)	0	3471	1553	181	1810	0	0	0	0	0	1787	2814
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			498									494
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		839			431			976			921	
Travel Time (s)		19.1			9.8			22.2			20.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1253	530	386	482	0	0	0	0	289	0	494
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1253	530	386	482	0	0	0	0	0	289	494
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			18			0			0	
Link Offset(ft)		6			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		20.0	20.0	7.0	20.0					10.0	10.0	10.0
Minimum Split (s)		26.5	26.5	13.5	26.5					16.0	16.0	16.0

5:00 pm Baseline

Synchro 10 Report

Page 1

Lanes, Volumes, Timings

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		40.0	40.0	25.0	65.0					35.0	35.0	35.0
Total Split (%)		40.0%	40.0%	25.0%	65.0%					35.0%	35.0%	35.0%
Maximum Green (s)		33.5	33.5	18.5	58.5					29.0	29.0	29.0
Yellow Time (s)		4.5	4.5	4.5	4.5					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.5	-2.5	-2.5	-2.5						-2.0	-2.0
Total Lost Time (s)		4.0	4.0	4.0	4.0						4.0	4.0
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	3.0
Recall Mode		Min	Min	None	Min					None	None	None
Act Effect Green (s)		36.2	36.2	60.8	60.8						22.6	22.6
Actuated g/C Ratio		0.40	0.40	0.67	0.67						0.25	0.25
v/c Ratio		0.91	0.58	0.83	0.40						0.66	0.46
Control Delay		38.8	5.8	45.5	9.2						38.2	4.0
Queue Delay		0.0	0.0	0.0	0.9						0.0	0.0
Total Delay		38.8	5.8	45.5	10.1						38.2	4.0
LOS		D	A	D	B						D	A
Approach Delay		29.0			25.8						16.6	
Approach LOS		C			C						B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 91.4

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 25.4

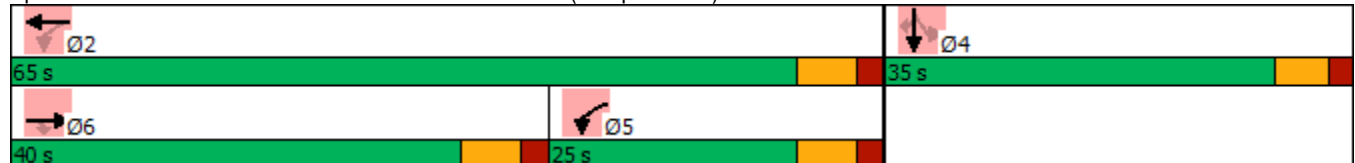
Intersection LOS: C

Intersection Capacity Utilization 91.0%

ICU Level of Service E

Analysis Period (min) 15

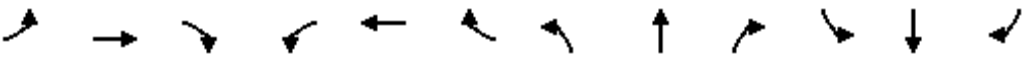
Splits and Phases: 1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

1: 41 SB ON/41 SB OFF & CTH BB (Prospect Ave.)

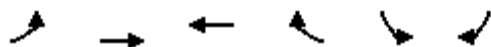
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑	↑						↑	↑↑
Traffic Volume (veh/h)	0	1040	440	320	400	0	0	0	0	240	0	410
Future Volume (veh/h)	0	1040	440	320	400	0	0	0	0	240	0	410
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1841	1841	1826	1826	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1253	530	386	482	0				289	0	494
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	4	4	5	5	0				1	1	1
Cap, veh/h	0	1417	632	462	1216	0				437	0	685
Arrive On Green	0.00	0.41	0.41	0.22	0.67	0.00				0.24	0.00	0.24
Sat Flow, veh/h	0	3589	1560	1739	1826	0				1795	0	2812
Grp Volume(v), veh/h	0	1253	530	386	482	0				289	0	494
Grp Sat Flow(s),veh/h/ln	0	1749	1560	1739	1826	0				1795	0	1406
Q Serve(g_s), s	0.0	29.3	27.0	14.0	10.6	0.0				12.8	0.0	14.2
Cycle Q Clear(g_c), s	0.0	29.3	27.0	14.0	10.6	0.0				12.8	0.0	14.2
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1417	632	462	1216	0				437	0	685
V/C Ratio(X)	0.00	0.88	0.84	0.84	0.40	0.00				0.66	0.00	0.72
Avail Cap(c_a), veh/h	0	1428	637	502	1263	0				631	0	989
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	24.3	23.6	31.1	6.7	0.0				30.1	0.0	30.6
Incr Delay (d2), s/veh	0.0	7.1	10.0	11.1	0.3	0.0				1.7	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	12.8	11.1	8.9	3.6	0.0				5.6	0.0	10.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	31.4	33.6	42.1	7.0	0.0				31.8	0.0	32.1
LnGrp LOS	A	C	C	D	A	A				C	A	C
Approach Vol, veh/h		1783			868						783	
Approach Delay, s/veh		32.1			22.6						32.0	
Approach LOS		C			C						C	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		62.7		25.5	23.0	39.7						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		58.5		29.0	18.5	33.5						
Max Q Clear Time (g_c+I1), s		12.6		16.2	16.0	31.3						
Green Ext Time (p_c), s		3.6		3.3	0.4	1.9						
Intersection Summary												
HCM 6th Ctrl Delay			29.6									
HCM 6th LOS			C									

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	870	410	720	210	0	0
Future Volume (vph)	870	410	720	210	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0			460	0	0
Storage Lanes	1			1	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		
Flt Protected	0.950					
Satd. Flow (prot)	1770	1863	1845	1568	0	0
Flt Permitted	0.121					
Satd. Flow (perm)	225	1863	1845	1568	0	0
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				190		
Link Speed (mph)		30	30		30	
Link Distance (ft)		431	560		977	
Travel Time (s)		9.8	12.7		22.2	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	2%	2%	3%	3%	1%	1%
Adj. Flow (vph)	897	423	742	216	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	897	423	742	216	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		18	30		0	
Link Offset(ft)		6	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1		
Detector Template						
Leading Detector (ft)	50	50	50	50		
Trailing Detector (ft)	0	0	0	0		
Detector 1 Position(ft)	0	0	0	0		
Detector 1 Size(ft)	50	50	50	50		
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0		
Detector 1 Queue (s)	0.0	0.0	0.0	0.0		
Detector 1 Delay (s)	0.0	0.0	0.0	0.0		
Turn Type	pm+pt	NA	NA	Perm		
Protected Phases	1	6	2			
Permitted Phases	6			2		
Detector Phase	1	6	2	2		
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0		
Minimum Split (s)	13.5	26.5	26.5	26.5		

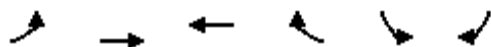
5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings

2: CTH BB (Prospect Ave.) & 41 NB ON

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	38.0	100.0	33.0	33.0		
Total Split (%)	38.0%	100.0%	33.0%	33.0%		
Maximum Green (s)	31.5	93.5	26.5	26.5		
Yellow Time (s)	4.5	4.5	4.5	4.5		
All-Red Time (s)	2.0	2.0	2.0	2.0		
Lost Time Adjust (s)	-2.5	-2.5	-2.5	-2.5		
Total Lost Time (s)	4.0	4.0	4.0	4.0		
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	4.0	4.0	4.0		
Recall Mode	None	Min	Min	Min		
Act Effect Green (s)	65.4	69.4	29.1	29.1		
Actuated g/C Ratio	0.94	1.00	0.42	0.42		
v/c Ratio	0.96	0.23	0.96	0.28		
Control Delay	38.1	0.3	47.0	4.3		
Queue Delay	0.7	0.0	0.0	0.0		
Total Delay	38.8	0.3	47.0	4.3		
LOS	D	A	D	A		
Approach Delay		26.5	37.4			
Approach LOS		C	D			

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 69.4

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 31.0

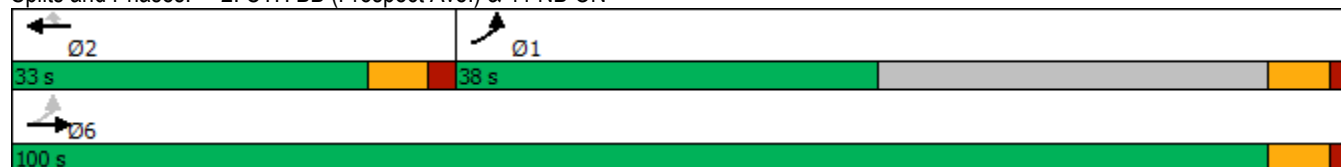
Intersection LOS: C

Intersection Capacity Utilization 91.0%

ICU Level of Service E

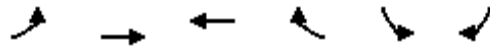
Analysis Period (min) 15

Splits and Phases: 2: CTH BB (Prospect Ave.) & 41 NB ON



HCM 6th Signalized Intersection Summary 2: CTH BB (Prospect Ave.) & 41 NB ON

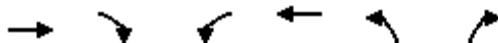
08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	870	410	720	210	0	0
Future Volume (veh/h)	870	410	720	210	0	0
Initial Q (Qb), veh	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00		
Work Zone On Approach		No	No			
Adj Sat Flow, veh/h/ln	1870	1870	1856	1856		
Adj Flow Rate, veh/h	897	423	742	216		
Peak Hour Factor	0.97	0.97	0.97	0.97		
Percent Heavy Veh, %	2	2	3	3		
Cap, veh/h	954	1765	758	643		
Arrive On Green	0.48	0.94	0.41	0.41		
Sat Flow, veh/h	1781	1870	1856	1572		
Grp Volume(v), veh/h	897	423	742	216		
Grp Sat Flow(s),veh/h/ln	1781	1870	1856	1572		
Q Serve(g_s), s	29.4	1.2	28.0	6.7		
Cycle Q Clear(g_c), s	29.4	1.2	28.0	6.7		
Prop In Lane	1.00			1.00		
Lane Grp Cap(c), veh/h	954	1765	758	643		
V/C Ratio(X)	0.94	0.24	0.98	0.34		
Avail Cap(c_a), veh/h	955	2531	758	643		
HCM Platoon Ratio	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	15.6	0.1	20.7	14.4		
Incr Delay (d2), s/veh	16.6	0.1	27.3	0.4		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	13.7	0.0	16.6	2.3		
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	32.3	0.2	48.0	14.8		
LnGrp LOS	C	A	D	B		
Approach Vol, veh/h		1320	958			
Approach Delay, s/veh		22.0	40.5			
Approach LOS		C	D			
Timer - Assigned Phs	1	2			6	
Phs Duration (G+Y+Rc), s	38.0	33.0			71.0	
Change Period (Y+Rc), s	6.5	6.5			6.5	
Max Green Setting (Gmax), s	31.5	26.5			93.5	
Max Q Clear Time (g_c+I1), s	31.4	30.0			3.2	
Green Ext Time (p_c), s	0.1	0.0			3.1	
Intersection Summary						
HCM 6th Ctrl Delay			29.8			
HCM 6th LOS			C			

Lanes, Volumes, Timings
3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Total Split (s)	59.0			59.0	41.0	41.0
Total Split (%)	59.0%			59.0%	41.0%	41.0%
Maximum Green (s)	53.0			53.0	35.0	35.0
Yellow Time (s)	4.0			4.0	4.0	4.0
All-Red Time (s)	2.0			2.0	2.0	2.0
Lost Time Adjust (s)	-2.0			-2.0	-2.0	-2.0
Total Lost Time (s)	4.0			4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0			4.0	3.0	3.0
Recall Mode	Min			Min	None	None
Act Effect Green (s)	39.8			39.8	19.6	19.6
Actuated g/C Ratio	0.59			0.59	0.29	0.29
v/c Ratio	0.44			0.79	0.48	0.67
Control Delay	9.8			17.8	25.8	11.9
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	9.9			17.8	25.8	11.9
LOS	A			B	C	B
Approach Delay	9.9			17.8	16.7	
Approach LOS	A			B	B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 68

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 15.5

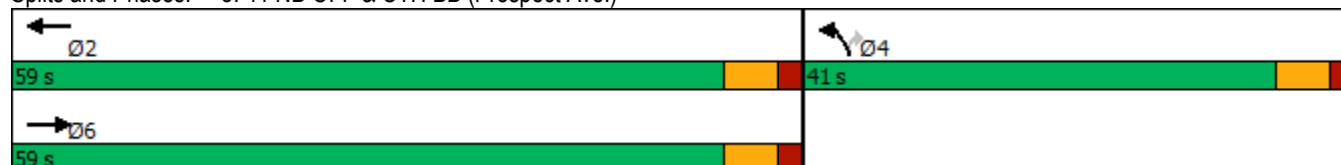
Intersection LOS: B

Intersection Capacity Utilization 56.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: 41 NB OFF & CTH BB (Prospect Ave.)



HCM 6th Signalized Intersection Summary

3: 41 NB OFF & CTH BB (Prospect Ave.)

08/22/2019

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↘	↗
Traffic Volume (veh/h)	410	0	0	720	210	400
Future Volume (veh/h)	410	0	0	720	210	400
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	0	0	1856	1870	1870
Adj Flow Rate, veh/h	482	0	0	847	247	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	2	0	0	3	2	2
Cap, veh/h	1106	0	0	1098	431	
Arrive On Green	0.59	0.00	0.00	0.59	0.24	0.00
Sat Flow, veh/h	1870	0	0	1856	1781	1585
Grp Volume(v), veh/h	482	0	0	847	247	0
Grp Sat Flow(s),veh/h/ln	1870	0	0	1856	1781	1585
Q Serve(g_s), s	6.8	0.0	0.0	16.5	5.9	0.0
Cycle Q Clear(g_c), s	6.8	0.0	0.0	16.5	5.9	0.0
Prop In Lane		0.00	0.00		1.00	1.00
Lane Grp Cap(c), veh/h	1106	0	0	1098	431	
V/C Ratio(X)	0.44	0.00	0.00	0.77	0.57	
Avail Cap(c_a), veh/h	2141	0	0	2124	1372	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	5.4	0.0	0.0	7.4	16.0	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.7	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.0	4.5	2.2	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	5.8	0.0	0.0	9.1	17.2	0.0
LnGrp LOS	A	A	A	A	B	
Approach Vol, veh/h	482			847	247	A
Approach Delay, s/veh	5.8			9.1	17.2	
Approach LOS	A			A	B	
Timer - Assigned Phs	2		4		6	
Phs Duration (G+Y+Rc), s	32.4		15.6		32.4	
Change Period (Y+Rc), s	6.0		6.0		6.0	
Max Green Setting (Gmax), s	53.0		35.0		53.0	
Max Q Clear Time (g_c+I1), s	18.5		7.9		8.8	
Green Ext Time (p_c), s	7.9		1.0		3.6	
Intersection Summary						
HCM 6th Ctrl Delay			9.3			
HCM 6th LOS			A			

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (vph)	0	1520	610	450	1540	0	0	0	0	220	0	280
Future Volume (vph)	0	1520	610	450	1540	0	0	0	0	220	0	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	0		0	450		450
Storage Lanes	0		1	1		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	5085	1583	1787	3574	0	0	0	0	1752	1665	2760
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			466									110
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			651			1026			1109	
Travel Time (s)		11.4			14.8			23.3			25.2	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	3%	3%	3%
Adj. Flow (vph)	0	1583	635	469	1604	0	0	0	0	229	0	292
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	1583	635	469	1604	0	0	0	0	0	229	292
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	R NA	R NA	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						8	
Permitted Phases			6							8		8
Detector Phase		6	6	5	2					8	8	8
Switch Phase												
Minimum Initial (s)		3.0	3.0	4.0	5.0					5.0	5.0	5.0
Minimum Split (s)		9.0	9.0	10.0	10.0					11.0	11.0	11.0

Lanes, Volumes, Timings

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Total Split (s)		39.0	39.0	40.0	79.0					21.0	21.0	21.0
Total Split (%)		39.0%	39.0%	40.0%	79.0%					21.0%	21.0%	21.0%
Maximum Green (s)		33.0	33.0	35.0	74.0					15.0	15.0	15.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	1.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	-1.0	-1.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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
Recall Mode		Max	Max	C-Max	C-Max					Max	Max	Max
Act Effect Green (s)		35.0	35.0	36.0	75.0					17.0	17.0	17.0
Actuated g/C Ratio		0.35	0.35	0.36	0.75					0.17	0.17	0.17
v/c Ratio		0.89	0.74	0.73	0.60					0.81	0.52	0.52
Control Delay		38.3	13.4	4.7	0.5					62.8	26.9	26.9
Queue Delay		0.5	0.0	0.0	2.4					0.0	0.0	0.0
Total Delay		38.8	13.4	4.7	2.9					62.8	26.9	26.9
LOS		D	B	A	A					E	C	C
Approach Delay		31.5			3.3					42.7		
Approach LOS		C			A					D		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 30 (30%), Referenced to phase 2:WBT and 5:WBL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 20.6

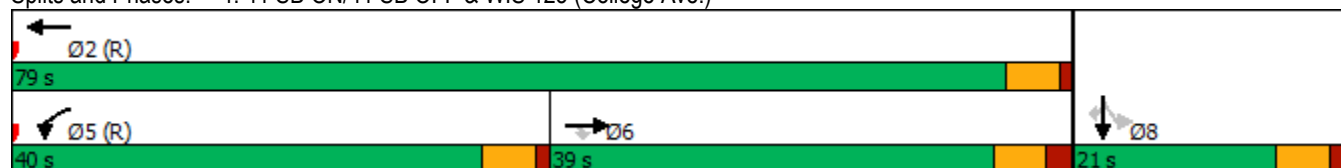
Intersection LOS: C

Intersection Capacity Utilization 94.7%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

4: 41 SB ON/41 SB OFF & WIS 125 (College Ave.)

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↑	↑	↑↑					↑	↑	↑↑
Traffic Volume (veh/h)	0	1520	610	450	1540	0	0	0	0	220	0	280
Future Volume (veh/h)	0	1520	610	450	1540	0	0	0	0	220	0	280
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1856	1856	1856
Adj Flow Rate, veh/h	0	1583	0	469	1604	0				229	0	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96				0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	1	1	0				3	3	3
Cap, veh/h	0	2579		979	3868	0				601	0	
Arrive On Green	0.00	0.17	0.00	0.55	1.00	0.00				0.17	0.00	0.00
Sat Flow, veh/h	0	5274	1585	1795	3676	0				3534	0	3145
Grp Volume(v), veh/h	0	1583	0	469	1604	0				229	0	0
Grp Sat Flow(s),veh/h/ln	0	1702	1585	1795	1791	0				1767	0	1572
Q Serve(g_s), s	0.0	28.8	0.0	16.1	0.0	0.0				5.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	28.8	0.0	16.1	0.0	0.0				5.8	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	2579		979	3868	0				601	0	
V/C Ratio(X)	0.00	0.61		0.48	0.41	0.00				0.38	0.00	
Avail Cap(c_a), veh/h	0	2579		979	3868	0				601	0	
HCM Platoon Ratio	1.00	0.33	0.33	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	32.6	0.0	14.0	0.0	0.0				36.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	0.0	0.0	0.0	0.0				1.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	13.3	0.0	6.2	0.0	0.0				2.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	33.7	0.0	14.0	0.0	0.0				38.7	0.0	0.0
LnGrp LOS	A	C		B	A	A				D	A	
Approach Vol, veh/h		1583	A		2073						229	A
Approach Delay, s/veh		33.7			3.2						38.7	
Approach LOS		C			A						D	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		114.0			59.2	54.8		21.0				
Change Period (Y+Rc), s		* 6			5.0	6.0		6.0				
Max Green Setting (Gmax), s		* 74			35.0	33.0		15.0				
Max Q Clear Time (g_c+I1), s		2.0			18.1	30.8		7.8				
Green Ext Time (p_c), s		13.1			1.9	1.6		0.6				
Intersection Summary												
HCM 6th Ctrl Delay			17.7									
HCM 6th LOS			B									
Notes												
User approved volume balancing among the lanes for turning movement.												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												
Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	750	990	0	0	1430	340	560	0	490	0	0	0
Future Volume (vph)	750	990	0	0	1430	340	560	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	225		280	600		600	0		0
Storage Lanes	1		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	1787	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Flt Permitted	0.118						0.950					
Satd. Flow (perm)	222	3574	0	0	5085	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						351			314			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		651			1111			1013			1111	
Travel Time (s)		14.8			25.3			23.0			25.3	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	773	1021	0	0	1474	351	577	0	505	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	773	1021	0	0	1474	351	577	0	505	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	R NA	R NA	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	pm+pt	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	3.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	13.0	9.0			10.0	10.0	10.0	10.0	10.0			

5:00 pm Baseline

Synchro 10 Report
Page 4

Lanes, Volumes, Timings
5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	44.0	78.0			34.0	34.0	22.0	22.0	22.0			
Total Split (%)	44.0%	78.0%			34.0%	34.0%	22.0%	22.0%	22.0%			
Maximum Green (s)	38.0	72.0			28.0	28.0	17.0	17.0	17.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	1.0	1.0	1.0			
Lost Time Adjust (s)	-2.0	-2.0			-2.0	-2.0	-1.0	-1.0	-1.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	C-Max	Max			Max	Max	Max	Max	Max			
Act Effct Green (s)	74.0	74.0			30.0	30.0	18.0		18.0			
Actuated g/C Ratio	0.74	0.74			0.30	0.30	0.18		0.18			
v/c Ratio	0.98	0.39			0.97	0.49	1.91		0.67			
Control Delay	34.7	0.2			51.5	5.5	448.1		18.8			
Queue Delay	25.2	0.0			0.0	0.0	0.0		0.0			
Total Delay	59.9	0.2			51.5	5.5	448.1		18.8			
LOS	E	A			D	A	F		B			
Approach Delay	25.9				42.6		247.7					
Approach LOS	C				D		F					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 75 (75%), Referenced to phase 1:EBL, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.91

Intersection Signal Delay: 83.5

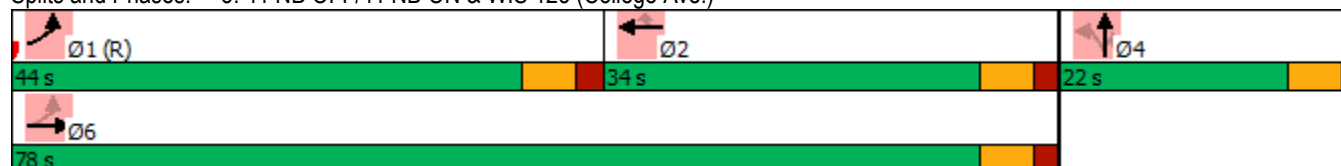
Intersection LOS: F

Intersection Capacity Utilization 94.7%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)



HCM 6th Signalized Intersection Summary

5: 41 NB OFF/41 NB ON & WIS 125 (College Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	750	990	0	0	1430	340	560	0	490	0	0	0
Future Volume (veh/h)	750	990	0	0	1430	340	560	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	773	1021	0	0	1474	0	577	0	0			
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97			
Percent Heavy Veh, %	1	1	0	0	2	2	2	2	2			
Cap, veh/h	800	2651	0	0	1532		641	0				
Arrive On Green	0.40	0.74	0.00	0.00	0.60	0.00	0.18	0.00	0.00			
Sat Flow, veh/h	1795	3676	0	0	5274	1585	3563	0	3170			
Grp Volume(v), veh/h	773	1021	0	0	1474	0	577	0	0			
Grp Sat Flow(s),veh/h/ln	1795	1791	0	0	1702	1585	1781	0	1585			
Q Serve(g_s), s	37.4	10.4	0.0	0.0	27.3	0.0	15.8	0.0	0.0			
Cycle Q Clear(g_c), s	37.4	10.4	0.0	0.0	27.3	0.0	15.8	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	800	2651	0	0	1532		641	0				
V/C Ratio(X)	0.97	0.39	0.00	0.00	0.96		0.90	0.00				
Avail Cap(c_a), veh/h	800	2651	0	0	1532		641	0				
HCM Platoon Ratio	1.00	1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00			
Upstream Filter(I)	0.33	0.33	0.00	0.00	1.00	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	24.3	4.7	0.0	0.0	19.5	0.0	40.1	0.0	0.0			
Incr Delay (d2), s/veh	11.5	0.1	0.0	0.0	15.6	0.0	18.0	0.0	0.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	18.0	3.1	0.0	0.0	8.4	0.0	8.4	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.8	4.9	0.0	0.0	35.1	0.0	58.1	0.0	0.0			
LnGrp LOS	D	A	A	A	D		E	A				
Approach Vol, veh/h	1794			1474			A			577		
Approach Delay, s/veh	18.2			35.1			58.1					
Approach LOS	B			D			E					
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	44.0	34.0		22.0		78.0						
Change Period (Y+Rc), s	6.0	6.0		5.0		6.0						
Max Green Setting (Gmax), s	38.0	28.0		17.0		72.0						
Max Q Clear Time (g_c+I1), s	39.4	29.3		17.8		12.4						
Green Ext Time (p_c), s	0.0	0.0		0.0		6.1						

Intersection Summary

HCM 6th Ctrl Delay	30.7
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↘	↑↑					↖	↗	↘
Traffic Volume (vph)	0	1900	590	690	1750	0	0	0	0	270	0	650
Future Volume (vph)	0	1900	590	690	1750	0	0	0	0	270	0	650
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	525		800	0		0	0		0	200		235
Storage Lanes	1		1	2		0	0		0	1		2
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.86	1.00	0.97	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.88
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	6408	1583	3433	3539	0	0	0	0	1787	1698	2814
Flt Permitted				0.950							0.950	
Satd. Flow (perm)	0	6408	1583	3433	3539	0	0	0	0	1787	1698	2814
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			430									76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1386			353			754			884	
Travel Time (s)		31.5			8.0			17.1			20.1	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	1939	602	704	1786	0	0	0	0	276	0	663
Shared Lane Traffic (%)										100%		
Lane Group Flow (vph)	0	1939	602	704	1786	0	0	0	0	0	276	663
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	R NA	R NA	Right
Median Width(ft)		16			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Prot	NA					Perm	NA	Perm
Protected Phases		6		5	2						4	
Permitted Phases			6							4		4
Detector Phase		6	6	5	2					4	4	4
Switch Phase												
Minimum Initial (s)		15.0	15.0	7.0	15.0					10.0	10.0	10.0
Minimum Split (s)		21.0	21.0	11.0	21.0					16.0	16.0	16.0

Lanes, Volumes, Timings

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		35.0	35.0	40.0	75.0					25.0	25.0	25.0
Total Split (%)		35.0%	35.0%	40.0%	75.0%					25.0%	25.0%	25.0%
Maximum Green (s)		29.0	29.0	36.0	69.0					19.0	19.0	19.0
Yellow Time (s)		4.0	4.0	3.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	1.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		-2.0	-2.0	0.0	-2.0					-2.0	-2.0	-2.0
Total Lost Time (s)		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)		4.0	4.0	2.0	4.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	Max	C-Max					Min	Min	Min
Act Effect Green (s)		31.0	31.0	36.0	71.0					21.0	21.0	21.0
Actuated g/C Ratio		0.31	0.31	0.36	0.71					0.21	0.21	0.21
v/c Ratio		0.98	0.76	0.57	0.71					0.78	1.02	1.02
Control Delay		50.0	16.1	1.0	2.9					53.6	76.1	76.1
Queue Delay		41.4	0.0	0.5	48.0					0.0	0.0	0.0
Total Delay		91.4	16.1	1.4	51.0					53.6	76.1	76.1
LOS		F	B	A	D					D	E	E
Approach Delay		73.6			37.0					69.5		
Approach LOS		E			D					E		

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 49 (49%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 57.7

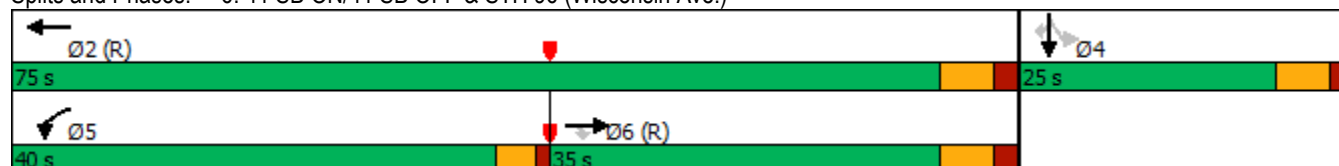
Intersection LOS: E

Intersection Capacity Utilization 82.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

6: 41 SB ON/41 SB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↗	↗↘	↑↑					↗	↗↘	↗↘
Traffic Volume (veh/h)	0	1900	590	690	1750	0	0	0	0	270	0	650
Future Volume (veh/h)	0	1900	590	690	1750	0	0	0	0	270	0	650
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1885	1885	1885
Adj Flow Rate, veh/h	0	1939	0	704	1786	0				276	0	663
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98				0.98	0.98	0.98
Percent Heavy Veh, %	0	2	2	2	2	0				1	1	1
Cap, veh/h	0	1995		1244	2523	0				754	0	671
Arrive On Green	0.00	0.31	0.00	0.36	0.71	0.00				0.21	0.00	0.21
Sat Flow, veh/h	0	6696	1585	3456	3647	0				3591	0	3195
Grp Volume(v), veh/h	0	1939	0	704	1786	0				276	0	663
Grp Sat Flow(s),veh/h/ln	0	1609	1585	1728	1777	0				1795	0	1598
Q Serve(g_s), s	0.0	29.8	0.0	16.4	29.3	0.0				6.6	0.0	20.7
Cycle Q Clear(g_c), s	0.0	29.8	0.0	16.4	29.3	0.0				6.6	0.0	20.7
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1995		1244	2523	0				754	0	671
V/C Ratio(X)	0.00	0.97		0.57	0.71	0.00				0.37	0.00	0.99
Avail Cap(c_a), veh/h	0	1995		1244	2523	0				754	0	671
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	0.09	0.09	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	34.1	0.0	25.7	8.5	0.0				33.8	0.0	39.4
Incr Delay (d2), s/veh	0.0	14.6	0.0	0.2	0.2	0.0				0.3	0.0	31.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	13.3	0.0	6.6	9.3	0.0				2.9	0.0	19.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	48.6	0.0	25.9	8.6	0.0				34.1	0.0	71.0
LnGrp LOS	A	D		C	A	A				C	A	E
Approach Vol, veh/h		1939	A		2490						939	
Approach Delay, s/veh		48.6			13.5						60.2	
Approach LOS		D			B						E	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		75.0		25.0	40.0	35.0						
Change Period (Y+Rc), s		6.0		6.0	4.0	6.0						
Max Green Setting (Gmax), s		69.0		19.0	36.0	29.0						
Max Q Clear Time (g_c+I1), s		31.3		22.7	18.4	31.8						
Green Ext Time (p_c), s		21.5		0.0	2.0	0.0						
Intersection Summary												
HCM 6th Ctrl Delay			34.4									
HCM 6th LOS			C									
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕			↕↕↕	↕	↕	↕	↕↕			
Traffic Volume (vph)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Future Volume (vph)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	525		525	280		280	0		0
Storage Lanes	2		0	1		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	1.00	0.86	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950					
Satd. Flow (prot)	3433	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Flt Permitted	0.950						0.950					
Satd. Flow (perm)	3433	3539	0	0	6408	1583	1681	1770	2787	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						357			254			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		353			1101			409			876	
Travel Time (s)		8.0			25.0			9.3			19.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	1092	1122	0	0	1990	357	500	0	500	0	0	0
Shared Lane Traffic (%)							0%					
Lane Group Flow (vph)	1092	1122	0	0	1990	357	500	0	500	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	R NA	R NA	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Perm		Perm			
Protected Phases	1	6			2			4				
Permitted Phases						2	4		4			
Detector Phase	1	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	7.0	15.0			15.0	15.0	10.0	10.0	10.0			
Minimum Split (s)	11.0	21.0			21.0	21.0	16.0	16.0	16.0			

Lanes, Volumes, Timings
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	37.0	77.0			40.0	40.0	23.0	23.0	23.0			
Total Split (%)	37.0%	77.0%			40.0%	40.0%	23.0%	23.0%	23.0%			
Maximum Green (s)	33.0	71.0			34.0	34.0	17.0	17.0	17.0			
Yellow Time (s)	3.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	-2.0			-2.0	-2.0	-2.0	-2.0	-2.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	2.0	4.0			4.0	4.0	3.0	3.0	3.0			
Recall Mode	Max	C-Max			C-Max	C-Max	Min	Min	Min			
Act Effct Green (s)	33.0	73.0			36.0	36.0	19.0		19.0			
Actuated g/C Ratio	0.33	0.73			0.36	0.36	0.19		0.19			
v/c Ratio	0.96	0.43			0.86	0.45	1.57		0.68			
Control Delay	17.2	2.9			34.6	4.4	300.4		23.4			
Queue Delay	42.6	6.1			1.0	0.0	0.0		0.0			
Total Delay	59.8	9.0			35.6	4.4	300.4		23.4			
LOS	E	A			D	A	F		C			
Approach Delay	34.1				30.8		161.9					
Approach LOS	C				C		F					

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 55.7

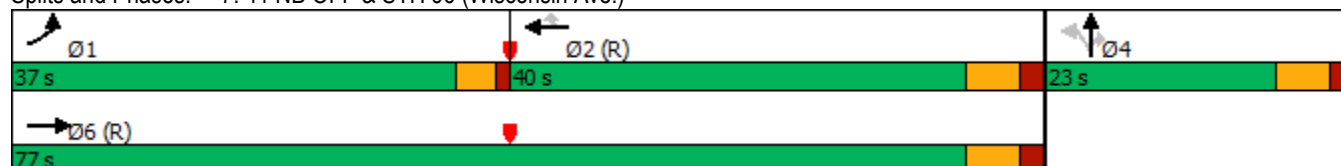
Intersection LOS: E

Intersection Capacity Utilization 82.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: 41 NB OFF & STH 96 (Wisconsin Ave.)



HCM 6th Signalized Intersection Summary

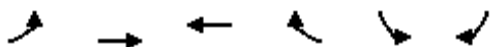
7: 41 NB OFF & STH 96 (Wisconsin Ave.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Future Volume (veh/h)	1070	1100	0	0	1950	350	490	0	490	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	1092	1122	0	0	1990	357	500	0	500			
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	1140	2594	0	0	2316	571	677	0	602			
Arrive On Green	0.22	0.49	0.00	0.00	0.36	0.36	0.19	0.00	0.19			
Sat Flow, veh/h	3456	3647	0	0	6696	1585	3563	0	3170			
Grp Volume(v), veh/h	1092	1122	0	0	1990	357	500	0	500			
Grp Sat Flow(s),veh/h/ln	1728	1777	0	0	1609	1585	1781	0	1585			
Q Serve(g_s), s	31.2	20.5	0.0	0.0	28.7	18.6	13.2	0.0	15.2			
Cycle Q Clear(g_c), s	31.2	20.5	0.0	0.0	28.7	18.6	13.2	0.0	15.2			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	1140	2594	0	0	2316	571	677	0	602			
V/C Ratio(X)	0.96	0.43	0.00	0.00	0.86	0.63	0.74	0.00	0.83			
Avail Cap(c_a), veh/h	1140	2594	0	0	2316	571	677	0	602			
HCM Platoon Ratio	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	0.15	0.15	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	38.3	12.1	0.0	0.0	29.7	26.4	38.2	0.0	38.9			
Incr Delay (d2), s/veh	4.4	0.1	0.0	0.0	4.4	5.1	4.3	0.0	9.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	14.3	8.7	0.0	0.0	11.4	7.7	6.1	0.0	6.6			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.6	12.2	0.0	0.0	34.1	31.6	42.4	0.0	48.5			
LnGrp LOS	D	B	A	A	C	C	D	A	D			
Approach Vol, veh/h	2214			2347			1000					
Approach Delay, s/veh	27.2			33.7			45.5					
Approach LOS	C			C			D					
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	37.0	40.0	23.0		77.0							
Change Period (Y+Rc), s	4.0	6.0	6.0		6.0							
Max Green Setting (Gmax), s	33.0	34.0	17.0		71.0							
Max Q Clear Time (g_c+I1), s	33.2	30.7	17.2		22.5							
Green Ext Time (p_c), s	0.0	3.1	0.0		11.4							
Intersection Summary												
HCM 6th Ctrl Delay				33.2								
HCM 6th LOS				C								
Notes												

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

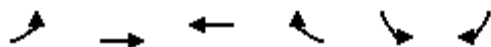
08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔↔	↑↑↑	↑↑↑	↔	↔	↔↔
Traffic Volume (vph)	310	2230	1430	560	210	1320
Future Volume (vph)	310	2230	1430	560	210	1320
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250			0	0	375
Storage Lanes	2			1	1	2
Taper Length (ft)	25				25	
Lane Util. Factor	0.97	0.91	0.91	1.00	1.00	0.88
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3433	5085	5136	1599	1752	2760
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	3433	5085	5136	1599	1752	2760
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				636		1
Link Speed (mph)		30	30		30	
Link Distance (ft)		1990	1183		425	
Travel Time (s)		45.2	26.9		9.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	2%	1%	1%	3%	3%
Adj. Flow (vph)	352	2534	1625	636	239	1500
Shared Lane Traffic (%)						
Lane Group Flow (vph)	352	2534	1625	636	239	1500
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		24	24		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	1	1	1	1	1
Detector Template						
Leading Detector (ft)	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	50	50	50	50	50	50
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	NA	NA	Perm	Prot	pm+ov
Protected Phases	1	6	2		4	1
Permitted Phases				2		4
Detector Phase	1	6	2	2	4	1
Switch Phase						
Minimum Initial (s)	7.0	20.0	20.0	20.0	10.0	7.0
Minimum Split (s)	13.0	26.0	26.0	26.0	16.0	13.0

Lanes, Volumes, Timings
8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Total Split (s)	18.0	52.0	34.0	34.0	43.0	18.0
Total Split (%)	18.9%	54.7%	35.8%	35.8%	45.3%	18.9%
Maximum Green (s)	13.0	46.0	28.0	28.0	37.0	13.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	3.0
Lead/Lag	Lead		Lag		Lead	
Lead-Lag Optimize?	Yes		Yes		Yes	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0	3.0
Recall Mode	None	C-Min	C-Min	C-Min	None	None
Act Effect Green (s)	30.3	65.7	31.4	31.4	21.3	56.6
Actuated g/C Ratio	0.32	0.69	0.33	0.33	0.22	0.60
v/c Ratio	0.32	0.72	0.96	0.67	0.61	0.91
Control Delay	26.3	11.4	24.2	20.1	39.1	26.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.3	11.4	24.2	20.1	39.1	26.7
LOS	C	B	C	C	D	C
Approach Delay	13.2		23.0		28.4	
Approach LOS	B		C		C	

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 20.3

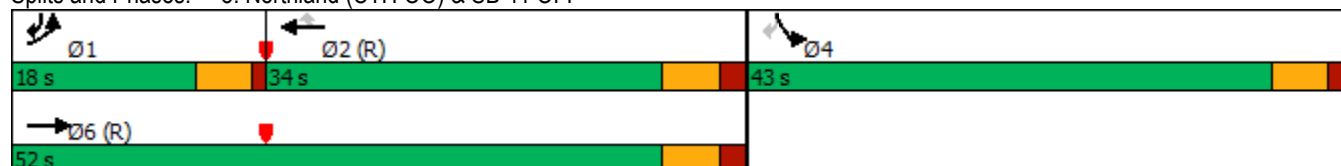
Intersection LOS: C

Intersection Capacity Utilization 80.5%

ICU Level of Service D

Analysis Period (min) 15

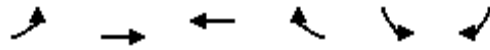
Splits and Phases: 8: Northland (CTH OO) & SB 41 OFF



HCM 6th Signalized Intersection Summary

8: Northland (CTH OO) & SB 41 OFF

08/22/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔↔	↑↑↑	↑↑↑	↔	↔	↔↔
Traffic Volume (veh/h)	310	2230	1430	560	210	1320
Future Volume (veh/h)	310	2230	1430	560	210	1320
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1885	1885	1856	1856
Adj Flow Rate, veh/h	352	2534	1625	0	239	1500
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	2	2	1	1	3	3
Cap, veh/h	459	2580	1700		725	1533
Arrive On Green	0.13	0.51	0.33	0.00	0.41	0.41
Sat Flow, veh/h	3456	5274	5316	1598	1767	2768
Grp Volume(v), veh/h	352	2534	1625	0	239	1500
Grp Sat Flow(s),veh/h/ln	1728	1702	1716	1598	1767	1384
Q Serve(g_s), s	9.3	46.3	29.4	0.0	8.8	39.0
Cycle Q Clear(g_c), s	9.3	46.3	29.4	0.0	8.8	39.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	459	2580	1700		725	1533
V/C Ratio(X)	0.77	0.98	0.96		0.33	0.98
Avail Cap(c_a), veh/h	509	2580	1700		725	1533
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.09	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.8	23.1	31.1	0.0	19.1	20.6
Incr Delay (d2), s/veh	6.3	14.0	1.9	0.0	0.4	18.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	20.4	12.0	0.0	3.6	32.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.0	37.1	33.0	0.0	19.5	38.7
LnGrp LOS	D	D	C		B	D
Approach Vol, veh/h		2886	1625	A	1739	
Approach Delay, s/veh		38.2	33.0		36.0	
Approach LOS		D	C		D	
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	16.6	35.4		43.0		52.0
Change Period (Y+Rc), s	5.0	6.0		6.0		6.0
Max Green Setting (Gmax), s	13.0	28.0		37.0		46.0
Max Q Clear Time (g_c+I1), s	11.3	31.4		41.0		48.3
Green Ext Time (p_c), s	0.3	0.0		0.0		0.0

Intersection Summary

HCM 6th Ctrl Delay	36.2
HCM 6th LOS	D

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑↑↑			↑↑↑	↔	↔	↔	↔			
Traffic Volume (vph)	1360	1080	0	0	1580	360	410	0	880	0	0	0
Future Volume (vph)	1360	1080	0	0	1580	360	410	0	880	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	0		340	200		670	0		0
Storage Lanes	2		0	0		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.91	1.00	1.00	0.86	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	3460	5136	0	0	6471	1599	1752	1665	1568	0	0	0
Flt Permitted	0.950							0.950				
Satd. Flow (perm)	3460	5136	0	0	6471	1599	1752	1665	1568	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						319			326			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1183			2176			1467			1203	
Travel Time (s)		26.9			49.5			33.3			27.3	
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
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	3%	3%	3%	1%	1%	1%
Bus Blockages (#/hr)	1	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	1478	1174	0	0	1717	391	446	0	957	0	0	0
Shared Lane Traffic (%)							100%					
Lane Group Flow (vph)	1478	1174	0	0	1717	391	0	446	957	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Prot	NA			NA	Perm	Split	NA	Free			
Protected Phases	1	6			2		4	4				
Permitted Phases						2			Free			
Detector Phase	1	6			2	2	4	4				
Switch Phase												
Minimum Initial (s)	7.0	20.0			20.0	20.0	10.0	10.0				

Lanes, Volumes, Timings

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	12.0	26.0			26.0	26.0	20.0	20.0				
Total Split (s)	45.0	73.0			28.0	28.0	22.0	22.0				
Total Split (%)	47.4%	76.8%			29.5%	29.5%	23.2%	23.2%				
Maximum Green (s)	40.0	67.0			22.0	22.0	16.0	16.0				
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
All-Red Time (s)	1.0	2.0			2.0	2.0	2.0	2.0				
Lost Time Adjust (s)	-1.0	-2.0			-2.0	-2.0	-2.0	-2.0				
Total Lost Time (s)	4.0	4.0			4.0	4.0	4.0	4.0				
Lead/Lag	Lead				Lag		Lag					
Lead-Lag Optimize?	Yes				Yes		Yes					
Vehicle Extension (s)	3.0	3.0			4.0	4.0	4.0	4.0				
Recall Mode	Min	C-Min			C-Min	C-Min	None	None				
Act Effect Green (s)	41.0	69.0			24.0	24.0		18.0	95.0			
Actuated g/C Ratio	0.43	0.73			0.25	0.25		0.19	1.00			
v/c Ratio	0.99	0.31			1.05	0.61		1.42	0.61			
Control Delay	36.7	3.4			72.3	11.2		236.7	1.8			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	36.7	3.4			72.3	11.2		236.7	1.8			
LOS	D	A			E	B		F	A			
Approach Delay		21.9			61.0			76.5				
Approach LOS		C			E			E				

Intersection Summary

Area Type: Other

Cycle Length: 95

Actuated Cycle Length: 95

Offset: 42 (44%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.42

Intersection Signal Delay: 47.7

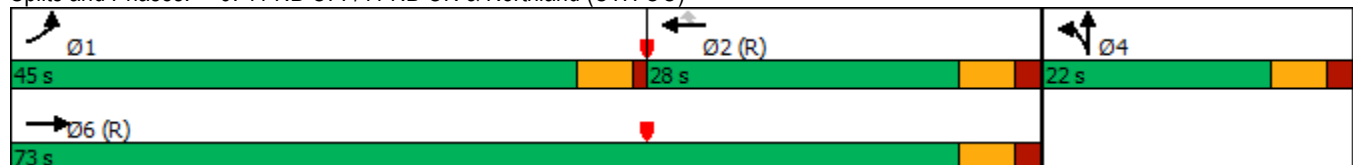
Intersection LOS: D

Intersection Capacity Utilization 83.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 9: 41 NB OFF/41 NB ON & Northland (CTH OO)



HCM 6th Signalized Intersection Summary

9: 41 NB OFF/41 NB ON & Northland (CTH OO)

08/22/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	1360	1080	0	0	1580	360	410	0	880	0	0	0	
Future Volume (veh/h)	1360	1080	0	0	1580	360	410	0	880	0	0	0	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0				
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00				
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Work Zone On Approach	No			No			No						
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1885	1885	1856	1856	1856				
Adj Flow Rate, veh/h	1478	1174	0	0	1717	0	446	0	0				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92				
Percent Heavy Veh, %	1	1	0	0	1	1	3	3	3				
Cap, veh/h	1503	3838	0	0	1765		601	0					
Arrive On Green	0.72	1.00	0.00	0.00	0.27	0.00	0.17	0.00	0.00				
Sat Flow, veh/h	3483	5316	0	0	6749	1598	3534	0	1572				
Grp Volume(v), veh/h	1478	1174	0	0	1717	0	446	0	0				
Grp Sat Flow(s),veh/h/ln	1742	1716	0	0	1621	1598	1767	0	1572				
Q Serve(g_s), s	38.6	0.0	0.0	0.0	24.9	0.0	11.4	0.0	0.0				
Cycle Q Clear(g_c), s	38.6	0.0	0.0	0.0	24.9	0.0	11.4	0.0	0.0				
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00				
Lane Grp Cap(c), veh/h	1503	3838	0	0	1765		601	0					
V/C Ratio(X)	0.98	0.31	0.00	0.00	0.97		0.74	0.00					
Avail Cap(c_a), veh/h	1503	3838	0	0	1765		670	0					
HCM Platoon Ratio	1.67	1.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Upstream Filter(I)	0.63	0.63	0.00	0.00	1.00	0.00	1.00	0.00	0.00				
Uniform Delay (d), s/veh	12.9	0.0	0.0	0.0	34.2	0.0	37.5	0.0	0.0				
Incr Delay (d2), s/veh	14.6	0.1	0.0	0.0	15.9	0.0	4.5	0.0	0.0				
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
%ile BackOfQ(50%),veh/ln	9.5	0.0	0.0	0.0	11.5	0.0	5.2	0.0	0.0				
Unsig. Movement Delay, s/veh													
LnGrp Delay(d),s/veh	27.6	0.1	0.0	0.0	50.1	0.0	41.9	0.0	0.0				
LnGrp LOS	C	A	A	A	D		D	A					
Approach Vol, veh/h	2652			1717			A			446			A
Approach Delay, s/veh	15.4			50.1			41.9						
Approach LOS	B			D			D						
Timer - Assigned Phs	1	2	4			6							
Phs Duration (G+Y+Rc), s	45.0	29.9	20.1			74.9							
Change Period (Y+Rc), s	5.0	6.0	6.0			6.0							
Max Green Setting (Gmax), s	40.0	22.0	16.0			67.0							
Max Q Clear Time (g_c+I1), s	40.6	26.9	13.4			2.0							
Green Ext Time (p_c), s	0.0	0.0	0.8			7.3							
Intersection Summary													
HCM 6th Ctrl Delay				30.3									
HCM 6th LOS				C									
Notes													
User approved volume balancing among the lanes for turning movement.													
Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.													

Lanes, Volumes, Timings

15: SB 41 OFF

08/22/2019

						
Lane Group	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	1.00	1.00	1.00	1.00
Fr t						
Flt Protected						
Satd. Flow (prot)	0	3278	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	0	3278	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	425			1098	985	
Travel Time (s)	9.7			25.0	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 0.0%	ICU Level of Service A					
Analysis Period (min) 15						

Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	720	0	310	0	0	0	0	1120	590	480	1250	0
Future Volume (vph)	720	0	310	0	0	0	0	1120	590	480	1250	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		400	0		0	300		245	0		0
Storage Lanes	1		1	0		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950									0.950		
Satd. Flow (prot)	1681	1770	1583	0	0	0	0	5085	1583	1787	3574	0
Flt Permitted	0.950									0.121		
Satd. Flow (perm)	1681	1770	1583	0	0	0	0	5085	1583	228	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76						604			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1099			921			1164			506	
Travel Time (s)		25.0			20.9			26.5			11.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	1%	1%	1%
Adj. Flow (vph)	774	0	333	0	0	0	0	1204	634	516	1344	0
Shared Lane Traffic (%)	0%											
Lane Group Flow (vph)	774	0	333	0	0	0	0	1204	634	516	1344	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	R NA	R NA	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm		Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					15.0	15.0	7.0	15.0	
Minimum Split (s)	16.0	16.0	16.0					21.0	21.0	11.0	21.0	

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	33.0	33.0	33.0					35.0	35.0	32.0	67.0	
Total Split (%)	33.0%	33.0%	33.0%					35.0%	35.0%	32.0%	67.0%	
Maximum Green (s)	27.0	27.0	27.0					29.0	29.0	28.0	61.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-2.0	-2.0	-2.0					-2.0	-2.0	0.0	-2.0	
Total Lost Time (s)	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					5.0	5.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Max	C-Max	Max	C-Max	
Act Effect Green (s)	29.0		29.0					31.0	31.0	63.0	63.0	
Actuated g/C Ratio	0.29		0.29					0.31	0.31	0.63	0.63	
v/c Ratio	1.59		0.65					0.76	0.70	0.89	0.60	
Control Delay	302.9		30.5					35.0	7.8	18.2	0.9	
Queue Delay	0.1		0.0					0.0	0.0	15.6	1.4	
Total Delay	302.9		30.5					35.0	7.8	33.7	2.3	
LOS	F		C					D	A	C	A	
Approach Delay		221.0						25.6			11.0	
Approach LOS		F						C			B	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.59

Intersection Signal Delay: 65.0

Intersection LOS: E

Intersection Capacity Utilization 93.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary

10: WIS 47 (Richmond St.) & 41 NB OFF/41 NB ON

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								  			  	
Traffic Volume (veh/h)	720	0	310	0	0	0	0	1120	590	480	1250	0
Future Volume (veh/h)	720	0	310	0	0	0	0	1120	590	480	1250	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870				0	1870	1870	1885	1885	0
Adj Flow Rate, veh/h	774	0	0				0	1204	0	516	1344	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2				0	2	2	1	1	0
Cap, veh/h	933	0					0	1727		628	2358	0
Arrive On Green	0.26	0.00	0.00				0.00	0.34	0.00	0.09	0.22	0.00
Sat Flow, veh/h	3563	0	1585				0	5274	1585	1795	3676	0
Grp Volume(v), veh/h	774	0	0				0	1204	0	516	1344	0
Grp Sat Flow(s),veh/h/ln	1781	0	1585				0	1702	1585	1795	1791	0
Q Serve(g_s), s	20.5	0.0	0.0				0.0	20.4	0.0	21.1	33.5	0.0
Cycle Q Clear(g_c), s	20.5	0.0	0.0				0.0	20.4	0.0	21.1	33.5	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	933	0					0	1727		628	2358	0
V/C Ratio(X)	0.83	0.00					0.00	0.70		0.82	0.57	0.00
Avail Cap(c_a), veh/h	1033	0					0	1727		628	2358	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	0.09	0.09	0.00
Uniform Delay (d), s/veh	34.8	0.0	0.0				0.0	28.7	0.0	29.8	26.5	0.0
Incr Delay (d2), s/veh	5.3	0.0	0.0				0.0	2.4	0.0	1.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.4	0.0	0.0				0.0	8.5	0.0	13.7	16.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.2	0.0	0.0				0.0	31.0	0.0	31.0	26.6	0.0
LnGrp LOS	D	A					A	C		C	C	A
Approach Vol, veh/h	774		A					1204	A	1860		
Approach Delay, s/veh	40.2							31.0		27.8		
Approach LOS	D							C		C		
Timer - Assigned Phs	2		4	5	6							
Phs Duration (G+Y+Rc), s	69.8		30.2	32.0	37.8							
Change Period (Y+Rc), s	6.0		6.0	4.0	6.0							
Max Green Setting (Gmax), s	61.0		27.0	28.0	29.0							
Max Q Clear Time (g_c+I1), s	35.5		22.5	23.1	22.4							
Green Ext Time (p_c), s	4.6		1.7	0.7	4.8							

Intersection Summary

HCM 6th Ctrl Delay	31.3
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	590	0	440	280	1560	0	0	1140	480
Future Volume (vph)	0	0	0	590	0	440	280	1560	0	0	1140	480
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	400		400	0		0	300		250
Storage Lanes	0		0	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950			0.950					
Satd. Flow (prot)	0	0	0	1681	1770	1583	1787	3574	0	0	5085	1583
Flt Permitted				0.950			0.133					
Satd. Flow (perm)	0	0	0	1681	1770	1583	250	3574	0	0	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						527
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		909			1200			506			920	
Travel Time (s)		20.7			27.3			11.5			20.9	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	648	0	484	308	1714	0	0	1253	527
Shared Lane Traffic (%)				0%								
Lane Group Flow (vph)	0	0	0	648	0	484	308	1714	0	0	1253	527
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	R NA	R NA	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm		Perm	pm+pt	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4	6					2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	15.0			15.0	15.0
Minimum Split (s)				16.0	16.0	16.0	11.0	21.0			21.0	21.0

Lanes, Volumes, Timings

23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				33.0	33.0	33.0	35.0	67.0			32.0	32.0
Total Split (%)				33.0%	33.0%	33.0%	35.0%	67.0%			32.0%	32.0%
Maximum Green (s)				27.0	27.0	27.0	31.0	61.0			26.0	26.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-2.0	-2.0	-2.0	0.0	-2.0			-2.0	-2.0
Total Lost Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	2.0	2.0			5.0	5.0
Recall Mode				Min	Min	Min	Max	C-Max			C-Max	C-Max
Act Effect Green (s)				29.0		29.0	63.0	63.0			28.0	28.0
Actuated g/C Ratio				0.29		0.29	0.63	0.63			0.28	0.28
v/c Ratio				1.33		0.94	0.49	0.76			0.88	0.64
Control Delay				193.7		58.5	5.2	4.2			43.0	6.7
Queue Delay				0.0		0.0	0.0	33.9			0.3	0.0
Total Delay				193.7		58.5	5.2	38.1			43.3	6.7
LOS				F		E	A	D			D	A
Approach Delay					135.9			33.1			32.4	
Approach LOS					F			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:SBT and 6:NBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.33

Intersection Signal Delay: 56.4

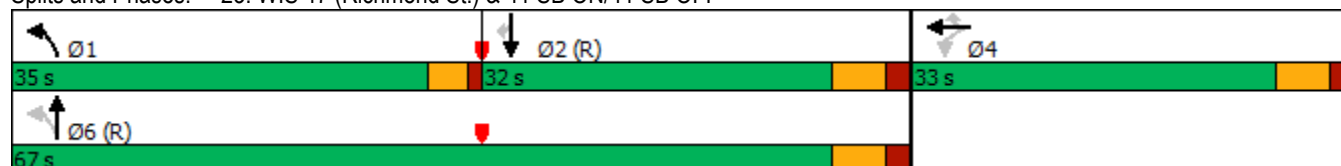
Intersection LOS: E

Intersection Capacity Utilization 93.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary
 23: WIS 47 (Richmond St.) & 41 SB ON/41 SB OFF

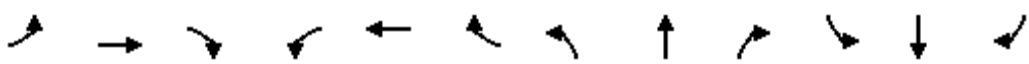
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	590	0	440	280	1560	0	0	1140	480
Future Volume (veh/h)	0	0	0	590	0	440	280	1560	0	0	1140	480
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1870	1870	1870	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				648	0	0	308	1714	0	0	1253	0
Peak Hour Factor				0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %				2	2	2	1	1	0	0	2	2
Cap, veh/h				825	0		675	2466	0	0	1728	
Arrive On Green				0.23	0.00	0.00	0.21	0.46	0.00	0.00	0.34	0.00
Sat Flow, veh/h				3563	0	1585	1795	3676	0	0	5274	1585
Grp Volume(v), veh/h				648	0	0	308	1714	0	0	1253	0
Grp Sat Flow(s),veh/h/ln				1781	0	1585	1795	1791	0	0	1702	1585
Q Serve(g_s), s				17.1	0.0	0.0	7.9	37.9	0.0	0.0	21.5	0.0
Cycle Q Clear(g_c), s				17.1	0.0	0.0	7.9	37.9	0.0	0.0	21.5	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				825	0		675	2466	0	0	1728	
V/C Ratio(X)				0.79	0.00		0.46	0.70	0.00	0.00	0.72	
Avail Cap(c_a), veh/h				1033	0		675	2466	0	0	1728	
HCM Platoon Ratio				1.00	1.00	1.00	0.67	0.67	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.09	0.09	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				36.1	0.0	0.0	14.7	18.6	0.0	0.0	29.0	0.0
Incr Delay (d2), s/veh				3.2	0.0	0.0	0.2	0.1	0.0	0.0	2.7	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				7.7	0.0	0.0	3.1	16.5	0.0	0.0	9.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				39.3	0.0	0.0	14.9	18.8	0.0	0.0	31.7	0.0
LnGrp LOS				D	A		B	B	A	A	C	
Approach Vol, veh/h					648	A		2022			1253	A
Approach Delay, s/veh					39.3			18.2			31.7	
Approach LOS					D			B			C	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	35.0	37.8		27.2		72.8						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	31.0	26.0		27.0		61.0						
Max Q Clear Time (g_c+I1), s	9.9	23.5		19.1		39.9						
Green Ext Time (p_c), s	0.7	2.0		2.1		6.4						
Intersection Summary												
HCM 6th Ctrl Delay				26.0								
HCM 6th LOS				C								
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	300	0	720	540	1390	0	0	1560	920
Future Volume (vph)	0	0	0	300	0	720	540	1390	0	0	1560	920
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	210		300	0		0	450		410
Storage Lanes	0		0	1		2	2		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	0.97	0.95	1.00	1.00	0.86	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1698	1698	2814	3467	3574	0	0	6408	1583
Flt Permitted				0.950	0.950		0.950					
Satd. Flow (perm)	0	0	0	1698	1698	2814	3467	3574	0	0	6408	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						604
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		756			820			575			1156	
Travel Time (s)		17.2			18.6			13.1			26.3	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	0	0	337	0	809	607	1562	0	0	1753	1034
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	168	169	809	607	1562	0	0	1753	1034
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	R NA	R NA	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			14	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm
Protected Phases					4		1	6			2	
Permitted Phases				4		4						2
Detector Phase				4	4	4	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	7.0	20.0			20.0	20.0
Minimum Split (s)				16.0	16.0	16.0	11.0	26.0			26.0	26.0

Lanes, Volumes, Timings

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				35.0	35.0	35.0	30.0	65.0			35.0	35.0
Total Split (%)				35.0%	35.0%	35.0%	30.0%	65.0%			35.0%	35.0%
Maximum Green (s)				29.0	29.0	29.0	26.0	59.0			29.0	29.0
Yellow Time (s)				4.0	4.0	4.0	3.0	4.0			4.0	4.0
All-Red Time (s)				2.0	2.0	2.0	1.0	2.0			2.0	2.0
Lost Time Adjust (s)				-1.0	-1.0	-1.0	-2.0	-2.0			-2.0	-2.0
Total Lost Time (s)				5.0	5.0	5.0	2.0	4.0			4.0	4.0
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				4.0	4.0	4.0	2.0	2.0			4.0	4.0
Recall Mode				Min	Min	Min	Max	C-Min			C-Min	C-Min
Act Effect Green (s)				29.8	29.8	29.8	28.2	61.2			31.0	31.0
Actuated g/C Ratio				0.30	0.30	0.30	0.28	0.61			0.31	0.31
v/c Ratio				0.33	0.33	0.91	0.62	0.71			0.88	1.14
Control Delay				29.6	29.6	46.1	7.2	7.1			39.2	92.0
Queue Delay				0.0	0.0	0.0	0.0	7.2			0.0	0.0
Total Delay				29.6	29.6	46.1	7.2	14.3			39.2	92.0
LOS				C	C	D	A	B			D	F
Approach Delay					41.2			12.3			58.8	
Approach LOS					D			B			E	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:SBT and 6:NBT, Start of 1st Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 39.0

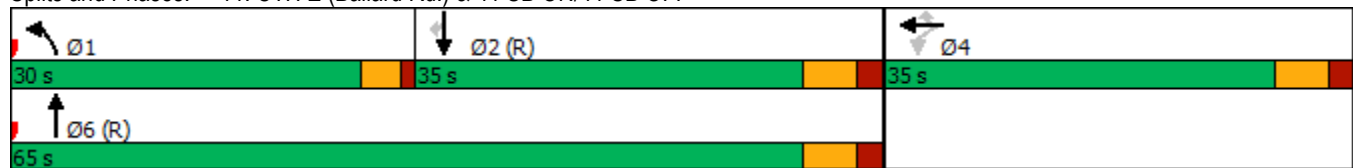
Intersection LOS: D

Intersection Capacity Utilization 91.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary

11: CTH E (Ballard Rd.) & 41 SB ON/41 SB OFF

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	300	0	720	540	1390	0	0	1560	920
Future Volume (veh/h)	0	0	0	300	0	720	540	1390	0	0	1560	920
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1870	1870
Adj Flow Rate, veh/h				337	0	809	607	1562	0	0	1753	0
Peak Hour Factor				0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %				1	1	1	1	1	0	0	2	2
Cap, veh/h				1045	0	930	975	2217	0	0	2053	
Arrive On Green				0.29	0.00	0.29	0.09	0.20	0.00	0.00	0.32	0.00
Sat Flow, veh/h				3591	0	3195	3483	3676	0	0	6696	1585
Grp Volume(v), veh/h				337	0	809	607	1562	0	0	1753	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1742	1791	0	0	1609	1585
Q Serve(g_s), s				7.3	0.0	24.0	16.8	40.5	0.0	0.0	25.5	0.0
Cycle Q Clear(g_c), s				7.3	0.0	24.0	16.8	40.5	0.0	0.0	25.5	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				1045	0	930	975	2217	0	0	2053	
V/C Ratio(X)				0.32	0.00	0.87	0.62	0.70	0.00	0.00	0.85	
Avail Cap(c_a), veh/h				1077	0	959	975	2217	0	0	2053	
HCM Platoon Ratio				1.00	1.00	1.00	0.33	0.33	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.29	0.29	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				27.7	0.0	33.7	40.3	31.3	0.0	0.0	31.9	0.0
Incr Delay (d2), s/veh				0.3	0.0	8.8	0.9	0.6	0.0	0.0	4.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				3.2	0.0	10.3	7.9	19.5	0.0	0.0	10.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				28.0	0.0	42.5	41.2	31.8	0.0	0.0	36.6	0.0
LnGrp LOS				C	A	D	D	C	A	A	D	
Approach Vol, veh/h					1146			2169			1753	A
Approach Delay, s/veh					38.2			34.4			36.6	
Approach LOS					D			C			D	
Timer - Assigned Phs	1	2		4		6						
Phs Duration (G+Y+Rc), s	30.0	35.9		34.1		65.9						
Change Period (Y+Rc), s	4.0	6.0		6.0		6.0						
Max Green Setting (Gmax), s	26.0	29.0		29.0		59.0						
Max Q Clear Time (g_c+I1), s	18.8	27.5		26.0		42.5						
Green Ext Time (p_c), s	1.2	1.3		2.1		5.2						

Intersection Summary

HCM 6th Ctrl Delay	36.1
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	570	0	180	0	0	0	0	1360	200	810	1050	0
Future Volume (vph)	570	0	180	0	0	0	0	1360	200	810	1050	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		300	0		0	200		280	0		0
Storage Lanes	1		2	0		0	1		1	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	0.88	1.00	1.00	1.00	1.00	0.86	1.00	0.97	0.95	1.00
Frt			0.850						0.850			
Flt Protected	0.950	0.950								0.950		
Satd. Flow (prot)	1698	1698	2814	0	0	0	0	6471	1599	3467	3574	0
Flt Permitted	0.950	0.950								0.950		
Satd. Flow (perm)	1698	1698	2814	0	0	0	0	6471	1599	3467	3574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			191						213			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		796			858			1043			575	
Travel Time (s)		18.1			19.5			23.7			13.1	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	606	0	191	0	0	0	0	1447	213	862	1117	0
Shared Lane Traffic (%)	50%											
Lane Group Flow (vph)	303	303	191	0	0	0	0	1447	213	862	1117	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	R NA	R NA	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			14			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	Prot	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6			
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	7.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.0	26.0	11.0	26.0	

5:00 pm Baseline

Synchro 10 Report
Page 10

Lanes, Volumes, Timings

12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	28.0	28.0	28.0					28.0	28.0	44.0	72.0	
Total Split (%)	28.0%	28.0%	28.0%					28.0%	28.0%	44.0%	72.0%	
Maximum Green (s)	22.0	22.0	22.0					22.0	22.0	40.0	66.0	
Yellow Time (s)	4.0	4.0	4.0					4.0	4.0	3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0					2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0					-2.0	-2.0	-2.0	-2.0	
Total Lost Time (s)	5.0	5.0	5.0					4.0	4.0	2.0	4.0	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					4.0	4.0	2.0	2.0	
Recall Mode	Min	Min	Min					C-Min	C-Min	Max	C-Min	
Act Effct Green (s)	22.0	22.0	22.0					24.0	24.0	43.0	69.0	
Actuated g/C Ratio	0.22	0.22	0.22					0.24	0.24	0.43	0.69	
v/c Ratio	0.81	0.81	0.25					0.93	0.39	0.58	0.45	
Control Delay	55.2	55.2	5.6					49.2	6.7	0.8	0.7	
Queue Delay	2.2	2.2	0.0					0.0	0.0	0.0	0.2	
Total Delay	57.3	57.3	5.6					49.2	6.7	0.8	0.9	
LOS	E	E	A					D	A	A	A	
Approach Delay		44.9						43.7			0.8	
Approach LOS		D						D			A	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 1 (1%), Referenced to phase 2:SBT and 6:NBT, Start of 1st Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 24.8

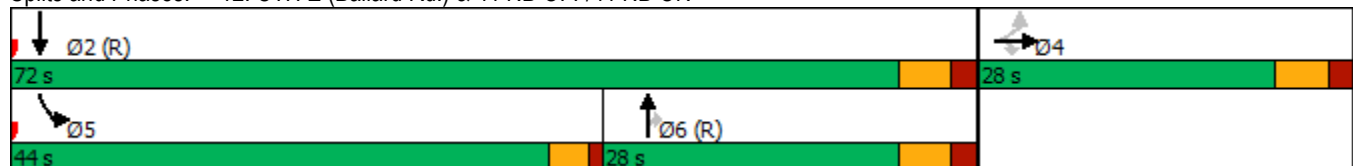
Intersection LOS: C

Intersection Capacity Utilization 91.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 12: CTH E (Ballard Rd.) & 41 NB OFF/41 NB ON

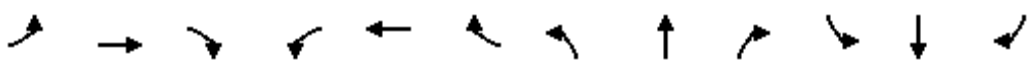
08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	570	0	180	0	0	0	0	1360	200	810	1050	0
Future Volume (veh/h)	570	0	180	0	0	0	0	1360	200	810	1050	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1885	1885	1885				0	1885	1885	1885	1885	0
Adj Flow Rate, veh/h	606	0	191				0	1447	0	862	1117	0
Peak Hour Factor	0.94	0.94	0.94				0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1				0	1	1	1	1	0
Cap, veh/h	754	0	671				0	1686		1463	2507	0
Arrive On Green	0.21	0.00	0.21				0.00	0.26	0.00	0.14	0.23	0.00
Sat Flow, veh/h	3591	0	3195				0	6749	1598	3483	3676	0
Grp Volume(v), veh/h	606	0	191				0	1447	0	862	1117	0
Grp Sat Flow(s),veh/h/ln	1795	0	1598				0	1621	1598	1742	1791	0
Q Serve(g_s), s	16.0	0.0	5.0				0.0	21.3	0.0	23.2	26.7	0.0
Cycle Q Clear(g_c), s	16.0	0.0	5.0				0.0	21.3	0.0	23.2	26.7	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	754	0	671				0	1686		1463	2507	0
V/C Ratio(X)	0.80	0.00	0.28				0.00	0.86		0.59	0.45	0.00
Avail Cap(c_a), veh/h	826	0	735				0	1686		1463	2507	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	0.33	0.33	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	0.00	0.44	0.44	0.00
Uniform Delay (d), s/veh	37.5	0.0	33.2				0.0	35.2	0.0	35.0	21.8	0.0
Incr Delay (d2), s/veh	5.8	0.0	0.3				0.0	5.9	0.0	0.8	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	0.0	4.8				0.0	8.9	0.0	10.9	12.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	43.3	0.0	33.5				0.0	41.2	0.0	35.8	22.1	0.0
LnGrp LOS	D	A	C				A	D		D	C	A
Approach Vol, veh/h	797						1447			A		
Approach Delay, s/veh	41.0						41.2			28.0		
Approach LOS	D						D			C		
Timer - Assigned Phs	2			4			5			6		
Phs Duration (G+Y+Rc), s	74.0			26.0			44.0			30.0		
Change Period (Y+Rc), s	6.0			6.0			4.0			6.0		
Max Green Setting (Gmax), s	66.0			22.0			40.0			22.0		
Max Q Clear Time (g_c+I1), s	28.7			18.0			25.2			23.3		
Green Ext Time (p_c), s	3.7			2.0			2.5			0.0		
Intersection Summary												
HCM 6th Ctrl Delay	35.0											
HCM 6th LOS	C											
Notes												
User approved volume balancing among the lanes for turning movement.												
Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (vph)	0	0	0	510	0	190	390	770	0	0	430	330
Future Volume (vph)	0	0	0	510	0	190	390	770	0	0	430	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		120	550		0	0		75
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1787	1599	1787	3574	0	0	3574	1599
Flt Permitted					0.950		0.330					
Satd. Flow (perm)	0	0	0	0	1787	1599	621	3574	0	0	3574	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						111						266
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		759			871			591			844	
Travel Time (s)		17.3			19.8			13.4			19.2	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Adj. Flow (vph)	0	0	0	607	0	226	464	917	0	0	512	393
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	607	226	464	917	0	0	512	393
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	1	1	1	1			1	1
Detector Template												
Leading Detector (ft)				50	50	50	50	50			50	50
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				50	50	50	50	50			50	50
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		1	6			2	
Permitted Phases				8		8	6					2
Detector Phase				8	8	8	1	6			2	2
Switch Phase												
Minimum Initial (s)				10.0	10.0	10.0	8.0	20.0			20.0	20.0
Minimum Split (s)				22.0	22.0	22.0	14.5	26.5			26.5	26.5

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)				39.0	39.0	39.0	36.0	66.0			30.0	30.0
Total Split (%)				37.1%	37.1%	37.1%	34.3%	62.9%			28.6%	28.6%
Maximum Green (s)				33.0	33.0	33.0	29.5	59.5			23.5	23.5
Yellow Time (s)				4.5	4.5	4.5	4.5	4.5			4.5	4.5
All-Red Time (s)				1.5	1.5	1.5	2.0	2.0			2.0	2.0
Lost Time Adjust (s)					-2.0	-2.0	-2.5	-2.5			-2.5	-2.5
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag							Lag				Lead	Lead
Lead-Lag Optimize?							Yes				Yes	Yes
Vehicle Extension (s)				3.0	3.0	3.0	4.0	3.0			4.0	4.0
Recall Mode				None	None	None	None	Min			Min	Min
Act Effect Green (s)					35.3	35.3	50.1	50.1			24.3	24.3
Actuated g/C Ratio					0.38	0.38	0.54	0.54			0.26	0.26
v/c Ratio					0.90	0.34	0.77	0.48			0.55	0.64
Control Delay					47.8	13.4	33.0	14.2			33.4	16.2
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					47.8	13.4	33.0	14.2			33.4	16.2
LOS					D	B	C	B			C	B
Approach Delay					38.4			20.5			25.9	
Approach LOS					D			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 93.4

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 26.8

Intersection LOS: C

Intersection Capacity Utilization 80.3%

ICU Level of Service D

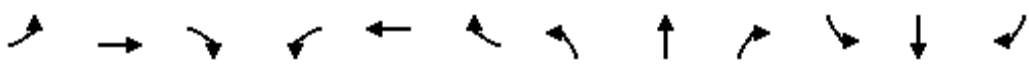
Analysis Period (min) 15

Splits and Phases: 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF



HCM 6th Signalized Intersection Summary 13: CTH N (Freedom Rd.) & 41 SB ON/41 SB OFF

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↶	↶	↶	↶↶			↶↶	↶
Traffic Volume (veh/h)	0	0	0	510	0	190	390	770	0	0	430	330
Future Volume (veh/h)	0	0	0	510	0	190	390	770	0	0	430	330
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1885	1885	1885	1885	1885	0	0	1885	1885
Adj Flow Rate, veh/h				607	0	0	464	917	0	0	512	0
Peak Hour Factor				0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Percent Heavy Veh, %				1	1	1	1	1	0	0	1	1
Cap, veh/h				673	0		572	1913	0	0	917	
Arrive On Green				0.37	0.00	0.00	0.23	0.53	0.00	0.00	0.26	0.00
Sat Flow, veh/h				1795	0	1598	1795	3676	0	0	3676	1598
Grp Volume(v), veh/h				607	0	0	464	917	0	0	512	0
Grp Sat Flow(s),veh/h/ln				1795	0	1598	1795	1791	0	0	1791	1598
Q Serve(g_s), s				28.1	0.0	0.0	13.3	14.1	0.0	0.0	10.9	0.0
Cycle Q Clear(g_c), s				28.1	0.0	0.0	13.3	14.1	0.0	0.0	10.9	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				673	0		572	1913	0	0	917	
V/C Ratio(X)				0.90	0.00		0.81	0.48	0.00	0.00	0.56	
Avail Cap(c_a), veh/h				715	0		808	2526	0	0	1059	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				26.0	0.0	0.0	28.2	12.8	0.0	0.0	28.4	0.0
Incr Delay (d2), s/veh				14.2	0.0	0.0	5.2	0.2	0.0	0.0	0.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				14.0	0.0	0.0	9.4	5.3	0.0	0.0	4.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				40.2	0.0	0.0	33.5	13.0	0.0	0.0	29.2	0.0
LnGrp LOS				D	A		C	B	A	A	C	
Approach Vol, veh/h					607	A		1381			512	A
Approach Delay, s/veh					40.2			19.9			29.2	
Approach LOS					D			B			C	
Timer - Assigned Phs	1	2				6		8				
Phs Duration (G+Y+Rc), s	24.5	26.5				51.0		37.0				
Change Period (Y+Rc), s	6.5	6.5				6.5		6.0				
Max Green Setting (Gmax), s	29.5	23.5				59.5		33.0				
Max Q Clear Time (g_c+I1), s	15.3	12.9				16.1		30.1				
Green Ext Time (p_c), s	2.6	2.5				5.2		0.9				

Intersection Summary

HCM 6th Ctrl Delay	26.7
HCM 6th LOS	C

Notes

Unsignalized Delay for [WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗					↖	↗	↖	↗	
Traffic Volume (vph)	630	0	370	0	0	0	0	530	190	170	770	0
Future Volume (vph)	630	0	370	0	0	0	0	530	190	170	770	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		265	0		0	0		75	75		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1752	1568	0	0	0	0	3438	1538	1752	3505	0
Flt Permitted		0.950								0.315		
Satd. Flow (perm)	0	1752	1568	0	0	0	0	3438	1538	581	3505	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			173						124			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		781			852			390			591	
Travel Time (s)		17.8			19.4			8.9			13.4	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	5%	5%	5%	3%	3%	3%
Adj. Flow (vph)	677	0	398	0	0	0	0	570	204	183	828	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	677	398	0	0	0	0	570	204	183	828	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1	1					1	1	1	1	
Detector Template												
Leading Detector (ft)	50	50	50					50	50	50	50	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	50	50	50					50	50	50	50	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Turn Type	Perm	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases		4						6		5	2	
Permitted Phases	4		4						6	2		
Detector Phase	4	4	4					6	6	5	2	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0					20.0	20.0	8.0	20.0	
Minimum Split (s)	16.0	16.0	16.0					26.5	26.5	14.5	26.5	

5:00 pm Baseline

Synchro 10 Report
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Lanes, Volumes, Timings

14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	39.0	39.0	39.0					30.0	30.0	36.0	66.0	
Total Split (%)	37.1%	37.1%	37.1%					28.6%	28.6%	34.3%	62.9%	
Maximum Green (s)	33.0	33.0	33.0					23.5	23.5	29.5	59.5	
Yellow Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	1.5					2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		-2.0	-2.0					-2.5	-2.5	-2.5	-2.5	
Total Lost Time (s)		4.0	4.0					4.0	4.0	4.0	4.0	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	4.0	4.0	4.0					3.0	3.0	4.0	3.0	
Recall Mode	None	None	None					Min	Min	None	Min	
Act Effct Green (s)		35.1	35.1					23.6	23.6	39.0	39.0	
Actuated g/C Ratio		0.43	0.43					0.29	0.29	0.48	0.48	
v/c Ratio		0.91	0.52					0.58	0.39	0.42	0.50	
Control Delay		40.9	12.5					27.9	12.2	20.8	15.9	
Queue Delay		0.0	0.0					0.0	0.0	0.0	0.0	
Total Delay		40.9	12.5					27.9	12.2	20.8	15.9	
LOS		D	B					C	B	C	B	
Approach Delay		30.4						23.8			16.8	
Approach LOS		C						C			B	

Intersection Summary

Area Type: Other

Cycle Length: 105

Actuated Cycle Length: 82.1

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 23.8

Intersection LOS: C

Intersection Capacity Utilization 80.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON



HCM 6th Signalized Intersection Summary 14: CTH N (Freedom Rd.) & 41 NB OFF/41 NB ON

08/22/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↩	↩					↩	↩	↩	↩	↩
Traffic Volume (veh/h)	630	0	370	0	0	0	0	530	190	170	770	0
Future Volume (veh/h)	630	0	370	0	0	0	0	530	190	170	770	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856				0	1826	1826	1856	1856	0
Adj Flow Rate, veh/h	677	0	0				0	570	0	183	828	0
Peak Hour Factor	0.93	0.93	0.93				0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3				0	5	5	3	3	0
Cap, veh/h	752	0					0	997		404	1665	0
Arrive On Green	0.43	0.00	0.00				0.00	0.29	0.00	0.13	0.47	0.00
Sat Flow, veh/h	1767	0	1572				0	3561	1547	1767	3618	0
Grp Volume(v), veh/h	677	0	0				0	570	0	183	828	0
Grp Sat Flow(s),veh/h/ln	1767	0	1572				0	1735	1547	1767	1763	0
Q Serve(g_s), s	27.9	0.0	0.0				0.0	11.0	0.0	0.0	12.7	0.0
Cycle Q Clear(g_c), s	27.9	0.0	0.0				0.0	11.0	0.0	0.0	12.7	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	752	0					0	997		404	1665	0
V/C Ratio(X)	0.90	0.00					0.00	0.57		0.45	0.50	0.00
Avail Cap(c_a), veh/h	790	0					0	1152		889	2791	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.0	0.0	0.0				0.0	23.8	0.0	27.9	14.2	0.0
Incr Delay (d2), s/veh	13.4	0.0	0.0				0.0	0.5	0.0	1.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.3	0.0	0.0				0.0	4.4	0.0	3.0	4.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.3	0.0	0.0				0.0	24.3	0.0	29.1	14.5	0.0
LnGrp LOS	C	A					A	C		C	B	A
Approach Vol, veh/h		677	A					570	A		1011	
Approach Delay, s/veh		34.3						24.3			17.1	
Approach LOS		C						C			B	
Timer - Assigned Phs		2		4	5	6						
Phs Duration (G+Y+Rc), s		41.0		37.3	14.5	26.5						
Change Period (Y+Rc), s		6.5		6.0	6.5	6.5						
Max Green Setting (Gmax), s		59.5		33.0	29.5	23.5						
Max Q Clear Time (g_c+I1), s		14.7		29.9	2.0	13.0						
Green Ext Time (p_c), s		4.6		1.4	1.1	2.0						
Intersection Summary												
HCM 6th Ctrl Delay			24.1									
HCM 6th LOS			C									
Notes												
Unsignalized Delay for [NBR, EBR] is excluded from calculations of the approach delay and intersection delay.												

Lanes, Volumes, Timings

19: CTH U (County Line Rd.) & 41 SB ON/41 SB OFF

08/22/2019

													
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	350	0	220	130	310	0	0	190	60	
Future Volume (vph)	0	0	0	350	0	220	130	310	0	0	190	60	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	
Frt						0.850							0.964
Flt Protected					0.950		0.950						
Satd. Flow (prot)	0	0	0	0	1736	1553	1787	1881	0	0	3379	0	
Flt Permitted					0.950		0.950						
Satd. Flow (perm)	0	0	0	0	1736	1553	1787	1881	0	0	3379	0	
Link Speed (mph)				30			30			30			
Link Distance (ft)				1011			1061			775			328
Travel Time (s)				23.0			24.1			17.6			7.5
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	1%	1%	1%	3%	3%	3%	
Parking (#/hr)				0									
Adj. Flow (vph)	0	0	0	398	0	250	148	352	0	0	216	68	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	0	0	0	398	250	148	352	0	0	284	0	
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No	
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right	
Median Width(ft)				0			12			12			
Link Offset(ft)				0			0			0			
Crosswalk Width(ft)				16			16			16			
Two way Left Turn Lane													
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)	15		9	15		9	15		9	15		9	
Sign Control	Stop		Stop				Free				Free		
Intersection Summary													
Area Type:	Other												
Control Type:	Unsignalized												
Intersection Capacity Utilization	43.8%				ICU Level of Service A								
Analysis Period (min)	15												

Intersection												
Int Delay, s/veh	51.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	350	0	220	130	310	0	0	190	60
Future Vol, veh/h	0	0	0	350	0	220	130	310	0	0	190	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	0	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	1	1	1	4	4	4	1	1	1	3	3	3
Mvmt Flow	0	0	0	398	0	250	148	352	0	0	216	68
Major/Minor												
Minor1				Major1				Major2				
Conflicting Flow All	756	932	352	284	0	-	-	-	-	-	0	-
Stage 1	648	648	-	-	-	-	-	-	-	-	-	-
Stage 2	108	284	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	6.66	6.56	6.26	4.115	-	-	-	-	-	-	-	-
Critical Hdwy Stg 1	5.46	5.56	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.86	5.56	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.538	4.038	3.338	2.2095	-	-	-	-	-	-	-	-
Pot Cap-1 Maneuver	~ 356	263	685	1283	-	0	0	-	-	-	-	-
Stage 1	515	461	-	-	-	0	0	-	-	-	-	-
Stage 2	900	671	-	-	-	0	0	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	~ 315	0	685	1283	-	-	-	-	-	-	-	-
Mov Cap-2 Maneuver	~ 315	0	-	-	-	-	-	-	-	-	-	-
Stage 1	456	0	-	-	-	-	-	-	-	-	-	-
Stage 2	900	0	-	-	-	-	-	-	-	-	-	-
Approach												
WB				NB				SB				
HCM Control Delay, s	112.8			2.4				0				
HCM LOS	F											
Minor Lane/Major Mvmt												
NBL				NBTWBLn1WBLn2				SBT SBR				
Capacity (veh/h)	1283	-	315	685	-	-	-	-	-	-	-	-
HCM Lane V/C Ratio	0.115	-	1.263	0.365	-	-	-	-	-	-	-	-
HCM Control Delay (s)	8.2	-	175.4	13.2	-	-	-	-	-	-	-	-
HCM Lane LOS	A	-	F	B	-	-	-	-	-	-	-	-
HCM 95th %tile Q(veh)	0.4	-	18.4	1.7	-	-	-	-	-	-	-	-
Notes												
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

Lanes, Volumes, Timings

20: CTH U (County Line Rd.) & 41 NB OFF/41 NB ON

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	0	90	0	0	0	0	310	220	120	420	0
Future Volume (vph)	130	0	90	0	0	0	0	310	220	120	420	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Frt			0.850					0.938				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1787	1599	0	0	0	0	3288	0	1787	1881	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1787	1599	0	0	0	0	3288	0	1787	1881	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1005			1114			374			775	
Travel Time (s)		22.8			25.3			8.5			17.6	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	3%	3%	3%	1%	1%	1%
Adj. Flow (vph)	151	0	105	0	0	0	0	360	256	140	488	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	151	105	0	0	0	0	616	0	140	488	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	43.8%						ICU Level of Service A					
Analysis Period (min)	15											

Intersection												
Int Delay, s/veh	6.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗					↕↗		↗	↕	
Traffic Vol, veh/h	130	0	90	0	0	0	0	310	220	120	420	0
Future Vol, veh/h	130	0	90	0	0	0	0	310	220	120	420	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	-	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	1	1	1	4	4	4	3	3	3	1	1	1
Mvmt Flow	151	0	105	0	0	0	0	360	256	140	488	0
Major/Minor	Minor2						Major1		Major2			
Conflicting Flow All	948	1384	488				-	0	0	616	0	0
Stage 1	768	768	-				-	-	-	-	-	-
Stage 2	180	616	-				-	-	-	-	-	-
Critical Hdwy	6.615	6.515	6.215				-	-	-	4.115	-	-
Critical Hdwy Stg 1	5.415	5.515	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.815	5.515	-				-	-	-	-	-	-
Follow-up Hdwy	3.5095	4.0095	3.3095				-	-	-	2.2095	-	-
Pot Cap-1 Maneuver	275	144	581				0	-	-	968	-	0
Stage 1	459	412	-				0	-	-	-	-	0
Stage 2	836	483	-				0	-	-	-	-	0
Platoon blocked, %								-	-	-		
Mov Cap-1 Maneuver	235	0	581				-	-	-	968	-	-
Mov Cap-2 Maneuver	235	0	-				-	-	-	-	-	-
Stage 1	392	0	-				-	-	-	-	-	-
Stage 2	836	0	-				-	-	-	-	-	-
Approach	EB						NB		SB			
HCM Control Delay, s	31.3						0		2.1			
HCM LOS	D											
Minor Lane/Major Mvmt		NBT	NBR	EBLn1	EBLn2	SBL	SBT					
Capacity (veh/h)		-	-	235	581	968	-					
HCM Lane V/C Ratio		-	-	0.643	0.18	0.144	-					
HCM Control Delay (s)		-	-	44.3	12.6	9.3	-					
HCM Lane LOS		-	-	E	B	A	-					
HCM 95th %tile Q(veh)		-	-	3.9	0.7	0.5	-					

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (vph)	0	230	90	200	200	0	0	0	0	200	0	300
Future Volume (vph)	0	230	90	200	200	0	0	0	0	200	0	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	250		0	0		0	0		250
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850									0.850
Flt Protected				0.950							0.950	
Satd. Flow (prot)	0	1863	1583	1787	1881	0	0	0	0	0	1770	1583
Flt Permitted				0.593							0.950	
Satd. Flow (perm)	0	1863	1583	1116	1881	0	0	0	0	0	1770	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			106									353
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		308			703			553			602	
Travel Time (s)		7.0			16.0			12.6			13.7	
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
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Adj. Flow (vph)	0	271	106	235	235	0	0	0	0	235	0	353
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	271	106	235	235	0	0	0	0	0	235	353
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		1	1	1	1					1	1	1
Detector Template												
Leading Detector (ft)		50	50	50	50					50	50	50
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		50	50	50	50					50	50	50
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Turn Type		NA	Perm	Perm	NA					Perm	NA	Perm
Protected Phases		6			2						4	
Permitted Phases			6	2						4		4
Detector Phase		6	6	2	2					4	4	4
Switch Phase												
Minimum Initial (s)		10.0	10.0	10.0	10.0					10.0	10.0	10.0
Minimum Split (s)		16.0	16.0	16.0	16.0					16.0	16.0	16.0

Lanes, Volumes, Timings

21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)		36.0	36.0	36.0	36.0					24.0	24.0	24.0
Total Split (%)		60.0%	60.0%	60.0%	60.0%					40.0%	40.0%	40.0%
Maximum Green (s)		30.0	30.0	30.0	30.0					18.0	18.0	18.0
Yellow Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
All-Red Time (s)		2.0	2.0	2.0	2.0					2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0						0.0	0.0
Total Lost Time (s)		6.0	6.0	6.0	6.0						6.0	6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	3.0
Recall Mode		Min	Min	Min	Min					None	None	None
Act Effect Green (s)		14.1	14.1	14.1	14.1						12.1	12.1
Actuated g/C Ratio		0.36	0.36	0.36	0.36						0.31	0.31
v/c Ratio		0.40	0.16	0.58	0.34						0.43	0.48
Control Delay		11.1	3.1	16.5	10.5						14.4	4.4
Queue Delay		0.0	0.0	0.0	0.0						0.0	0.0
Total Delay		11.1	3.1	16.5	10.5						14.4	4.4
LOS		B	A	B	B						B	A
Approach Delay		8.9			13.5						8.4	
Approach LOS		A			B						A	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 38.7

Natural Cycle: 40

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 10.2

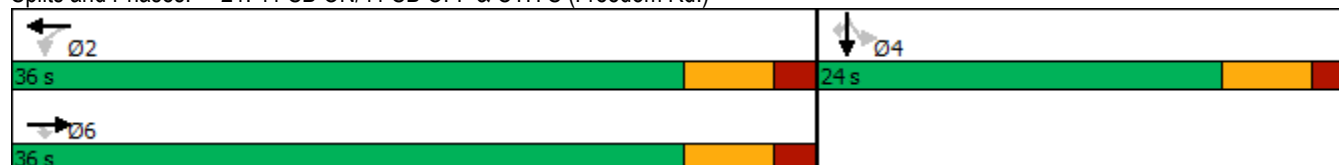
Intersection LOS: B

Intersection Capacity Utilization 50.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)



HCM 6th Signalized Intersection Summary
 21: 41 SB ON/41 SB OFF & CTH S (Freedom Rd.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (veh/h)	0	230	90	200	200	0	0	0	0	200	0	300
Future Volume (veh/h)	0	230	90	200	200	0	0	0	0	200	0	300
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1885	1885	0				1870	1870	1870
Adj Flow Rate, veh/h	0	271	106	235	235	0				235	0	353
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85				0.85	0.85	0.85
Percent Heavy Veh, %	0	2	2	1	1	0				2	2	2
Cap, veh/h	0	766	649	492	772	0				524	0	466
Arrive On Green	0.00	0.41	0.41	0.41	0.41	0.00				0.29	0.00	0.29
Sat Flow, veh/h	0	1870	1585	1014	1885	0				1781	0	1585
Grp Volume(v), veh/h	0	271	106	235	235	0				235	0	353
Grp Sat Flow(s),veh/h/ln	0	1870	1585	1014	1885	0				1781	0	1585
Q Serve(g_s), s	0.0	4.0	1.7	8.4	3.4	0.0				4.3	0.0	8.2
Cycle Q Clear(g_c), s	0.0	4.0	1.7	12.5	3.4	0.0				4.3	0.0	8.2
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	766	649	492	772	0				524	0	466
V/C Ratio(X)	0.00	0.35	0.16	0.48	0.30	0.00				0.45	0.00	0.76
Avail Cap(c_a), veh/h	0	1387	1176	829	1398	0				793	0	705
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	8.2	7.6	12.6	8.1	0.0				11.6	0.0	13.0
Incr Delay (d2), s/veh	0.0	0.3	0.1	0.7	0.2	0.0				0.6	0.0	2.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.2	0.4	1.6	1.1	0.0				1.5	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	8.5	7.7	13.3	8.3	0.0				12.2	0.0	15.5
LnGrp LOS	A	A	A	B	A	A				B	A	B
Approach Vol, veh/h		377			470						588	
Approach Delay, s/veh		8.3			10.8						14.2	
Approach LOS		A			B						B	
Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		22.6		17.9		22.6						
Change Period (Y+Rc), s		6.0		6.0		6.0						
Max Green Setting (Gmax), s		30.0		18.0		30.0						
Max Q Clear Time (g_c+I1), s		14.5		10.2		6.0						
Green Ext Time (p_c), s		2.1		1.7		1.5						
Intersection Summary												
HCM 6th Ctrl Delay				11.5								
HCM 6th LOS				B								

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	260	0	0	340	250	60	0	210	0	0	0
Future Volume (vph)	170	260	0	0	340	250	60	0	210	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	325		0	0		300	0		250	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950							0.950				
Satd. Flow (prot)	1787	1881	0	0	1863	1583	0	1719	1538	0	0	0
Flt Permitted	0.531							0.950				
Satd. Flow (perm)	999	1881	0	0	1863	1583	0	1719	1538	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						284			239			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		703			455			640			620	
Travel Time (s)		16.0			10.3			14.5			14.1	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	5%	5%	5%	5%	5%	5%
Adj. Flow (vph)	193	295	0	0	386	284	68	0	239	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	193	295	0	0	386	284	0	68	239	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	1			1	1	1	1	1			
Detector Template												
Leading Detector (ft)	50	50			50	50	50	50	50			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	50	50			50	50	50	50	50			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Turn Type	Perm	NA			NA	Perm	Perm	NA	Perm			
Protected Phases		6			2			4				
Permitted Phases	6					2	4		4			
Detector Phase	6	6			2	2	4	4	4			
Switch Phase												
Minimum Initial (s)	10.0	10.0			10.0	10.0	10.0	10.0	10.0			
Minimum Split (s)	16.0	16.0			16.0	16.0	16.0	16.0	16.0			

Lanes, Volumes, Timings

22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Split (s)	42.0	42.0			42.0	42.0	18.0	18.0	18.0			
Total Split (%)	70.0%	70.0%			70.0%	70.0%	30.0%	30.0%	30.0%			
Maximum Green (s)	36.0	36.0			36.0	36.0	12.0	12.0	12.0			
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
All-Red Time (s)	2.0	2.0			2.0	2.0	2.0	2.0	2.0			
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0	0.0			
Total Lost Time (s)	6.0	6.0			6.0	6.0		6.0	6.0			
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	Min	Min			Min	Min	None	None	None			
Act Effct Green (s)	15.8	15.8			15.8	15.8		10.2	10.2			
Actuated g/C Ratio	0.41	0.41			0.41	0.41		0.27	0.27			
v/c Ratio	0.47	0.38			0.50	0.35		0.15	0.41			
Control Delay	12.5	9.4			10.8	2.5		12.1	4.9			
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0			
Total Delay	12.5	9.4			10.8	2.5		12.1	4.9			
LOS	B	A			B	A		B	A			
Approach Delay		10.6			7.3			6.5				
Approach LOS		B			A			A				

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 38.1

Natural Cycle: 40

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 8.2

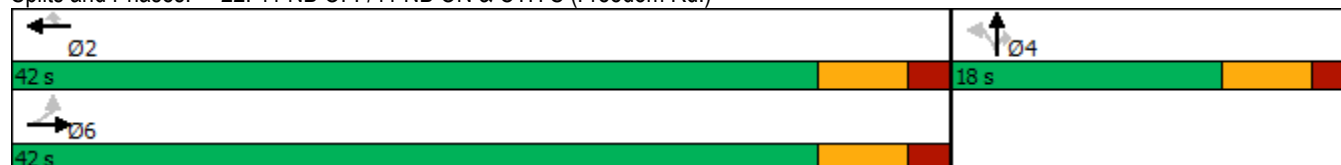
Intersection LOS: A

Intersection Capacity Utilization 50.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)



HCM 6th Signalized Intersection Summary
 22: 41 NB OFF/41 NB ON & CTH S (Freedom Rd.)

08/22/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	170	260	0	0	340	250	60	0	210	0	0	0
Future Volume (veh/h)	170	260	0	0	340	250	60	0	210	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach	No			No			No					
Adj Sat Flow, veh/h/ln	1885	1885	0	0	1870	1870	1826	1826	1826			
Adj Flow Rate, veh/h	193	295	0	0	386	284	68	0	239			
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88			
Percent Heavy Veh, %	1	1	0	0	2	2	5	5	5			
Cap, veh/h	434	890	0	0	883	748	410	0	365			
Arrive On Green	0.47	0.47	0.00	0.00	0.47	0.47	0.24	0.00	0.24			
Sat Flow, veh/h	773	1885	0	0	1870	1585	1739	0	1547			
Grp Volume(v), veh/h	193	295	0	0	386	284	68	0	239			
Grp Sat Flow(s),veh/h/ln	773	1885	0	0	1870	1585	1739	0	1547			
Q Serve(g_s), s	9.1	4.0	0.0	0.0	5.6	4.7	1.3	0.0	5.7			
Cycle Q Clear(g_c), s	14.7	4.0	0.0	0.0	5.6	4.7	1.3	0.0	5.7			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	434	890	0	0	883	748	410	0	365			
V/C Ratio(X)	0.44	0.33	0.00	0.00	0.44	0.38	0.17	0.00	0.65			
Avail Cap(c_a), veh/h	746	1651	0	0	1638	1388	508	0	452			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	12.1	6.8	0.0	0.0	7.2	7.0	12.5	0.0	14.2			
Incr Delay (d2), s/veh	0.7	0.2	0.0	0.0	0.3	0.3	0.2	0.0	2.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	1.3	1.1	0.0	0.0	1.6	1.1	0.4	0.0	1.9			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.8	7.0	0.0	0.0	7.6	7.3	12.7	0.0	16.6			
LnGrp LOS	B	A	A	A	A	A	B	A	B			
Approach Vol, veh/h	488			670			307					
Approach Delay, s/veh	9.3			7.4			15.7					
Approach LOS	A			A			B					
Timer - Assigned Phs	2			4			6					
Phs Duration (G+Y+Rc), s	25.4			15.7			25.4					
Change Period (Y+Rc), s	6.0			6.0			6.0					
Max Green Setting (Gmax), s	36.0			12.0			36.0					
Max Q Clear Time (g_c+I1), s	7.6			7.7			16.7					
Green Ext Time (p_c), s	3.1			0.5			2.7					
Intersection Summary												
HCM 6th Ctrl Delay	9.8											
HCM 6th LOS	A											

APPENDIX O17

Year 2048 Build HCS7 (Roundabouts) AM & PM Peak Hour

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	90	0	370					0		660	170	0	60	300	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	105	0	430					0		753	194	0	68	339	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		105.00	430.00				451.80	301.20	194.00	36.63	370.37	
Entry Volume veh/h		98.13	401.87				430.29	286.86	184.76	35.22	356.13	
Circulating Flow (v_c), pc/h	407			858			173			0		
Exiting Flow (v_{ex}), pc/h	68			0			858			339		
Capacity (C_{PCE}), pc/h		958.27	987.72				1123.85	1123.85	1219.48	1285.71	1285.71	
Capacity (c), veh/h		895.58	923.11				1070.33	1070.33	1161.41	1236.26	1236.26	
v/c Ratio (x)		0.11	0.44				0.40	0.27	0.16	0.03	0.29	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.1	9.0				7.6	5.9	4.5	3.1	5.5	
Lane LOS		A	A				A	A	A	A	A	
95% Queue, veh		0.4	2.2				2.0	1.1	0.6	0.1	1.2	
Approach Delay, s/veh	8.3						6.4			5.3		
Approach LOS	A						A			A		
Intersection Delay, s/veh LOS	6.7						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT			L	T				T	
Volume (V), veh/h					0	100	0	120	0	330	420		0		260	240
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (v_{pce}), pc/h					0	109	0	130	0	358	456		0		288	266
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					109.00	130.00	358.00	456.00			288.00	266.00
Entry Volume veh/h					107.92	128.71	354.46	451.49			279.61	258.25
Circulating Flow (v_c), pc/h	397			814			0			467		
Exiting Flow (v_{ex}), pc/h	0			358			456			397		
Capacity (c_{pce}), pc/h					714.21	901.81	1285.71	1285.71			894.13	973.23
Capacity (c), veh/h					707.14	892.88	1272.98	1272.98			868.08	944.89
v/c Ratio (x)					0.15	0.14	0.28	0.35			0.32	0.27

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					6.8	5.4	5.3	6.1			7.7	6.6
Lane LOS					A	A	A	A			A	A
95% Queue, veh					0.5	0.5	1.1	1.6			1.4	1.1
Approach Delay, s/veh				6.0			5.8			7.2		
Approach LOS				A			A			A		
Intersection Delay, s/veh LOS	6.3						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.86
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	270	0	160					0		380	440	0	130	230	
Percent Heavy Vehicles, %	0	1	0	1					0		3	3	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	317	0	188					0		455	527	0	157	278	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000	4.2000					4.2000	4.2000		4.2000	
Follow-Up Headway (s)		2.8000	2.8000					2.8000	2.8000		2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		317.00	188.00					455.00	527.00		435.00	
Entry Volume veh/h		313.86	186.14					441.75	511.65		418.27	
Circulating Flow (v_c), pc/h	435			772			474			0		
Exiting Flow (v_{ex}), pc/h	157			0			772			278		
Capacity (C_{PCE}), pc/h		916.66	1035.72					889.27	1137.92		1285.71	
Capacity (c), veh/h		907.58	1025.46					863.37	1104.78		1236.26	
v/c Ratio (x)		0.35	0.18					0.51	0.46		0.34	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.8	5.2					11.0	8.4		6.1	
Lane LOS		A	A					B	A		A	
95% Queue, veh		1.6	0.7					3.0	2.5		1.5	
Approach Delay, s/veh	6.8						9.6			6.1		
Approach LOS	A						A			A		
Intersection Delay, s/veh LOS	8.1						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	AM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.88
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LT				LT				T	
Volume (V), veh/h					0	150	0	120	0	240	410		0		210	410
Percent Heavy Vehicles, %					0	9	0	9	0	1	1		0		17	17
Flow Rate (V_{PCE}), pc/h					0	186	0	149	0	275	471		0		279	545
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000	4.2000		4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000		2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					186.00	149.00		746.00			279.00	545.00
Entry Volume veh/h					170.64	136.70		738.61			238.46	465.81
Circulating Flow (v_c), pc/h	465			746			0			461		
Exiting Flow (v_{ex}), pc/h	0			275			471			465		
Capacity (C_{PCE}), pc/h					719.71	891.35		1285.71			898.31	1038.13
Capacity (c), veh/h					660.28	817.75		1272.98			767.79	887.29
v/c Ratio (x)					0.26	0.17		0.58			0.31	0.52

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					8.6	6.1		9.6			8.3	11.1
Lane LOS					A	A		A			A	B
95% Queue, veh					1.0	0.6		3.9			1.3	3.1
Approach Delay, s/veh				7.5			9.6			10.1		
Approach LOS				A			A			B		
Intersection Delay, s/veh LOS	9.4						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & WIS 55
E/W Street Name	I-41 NB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	I-41 NB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	160	0	510					0		770	150	0	60	430	
Percent Heavy Vehicles, %	0	7	0	7					0		5	5	0	4	4	
Flow Rate (V_{PCE}), pc/h	0	186	0	593					0		879	171	0	68	486	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.0000	4.2000				4.2000	4.2000	4.2000	4.2000	4.2000	
Follow-Up Headway (s)		2.8000	2.8000				2.8000	2.8000	2.8000	2.8000	2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		186.00	593.00				659.25	219.75	171.00	38.78	515.22	
Entry Volume veh/h		173.83	554.21				627.86	209.29	162.86	37.29	495.40	
Circulating Flow (v_c), pc/h	554			1065			254			0		
Exiting Flow (v_{ex}), pc/h	68			0			1065			486		
Capacity (C_{PCE}), pc/h		861.74	881.01				1055.23	1055.23	1219.48	1285.71	1285.71	
Capacity (c), veh/h		805.37	823.37				1004.98	1004.98	1161.41	1236.26	1236.26	
v/c Ratio (x)		0.22	0.67				0.62	0.21	0.14	0.03	0.40	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.8	16.2				12.5	5.6	4.3	3.2	6.8	
Lane LOS		A	C				B	A	A	A	A	
95% Queue, veh		0.8	5.3				4.6	0.8	0.5	0.1	2.0	
Approach Delay, s/veh	14.0						9.7			6.6		
Approach LOS	B						A			A		
Intersection Delay, s/veh LOS	10.3						B					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & WIS 55
E/W Street Name	I-41 SB ramp
N/S Street Name	WIS 55
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.93
Jurisdiction	I-41 SB & WIS 55

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0
Lane Assignment							LT		L		T				T	
Volume (V), veh/h					0	240	0	90	0	550	380		0		250	140
Percent Heavy Vehicles, %					0	1	0	1	0	1	1		0		3	3
Flow Rate (v_{pce}), pc/h					0	261	0	98	0	597	413		0		277	155
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					2				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.0000	4.2000	4.2000	4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000	2.8000	2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					261.00	98.00	597.00	413.00			277.00	155.00
Entry Volume veh/h					258.42	97.03	591.09	408.91			268.93	150.49
Circulating Flow (v_c), pc/h	538			1010			0			858		
Exiting Flow (v_{ex}), pc/h	0			597			413			538		
Capacity (c_{pce}), pc/h					619.94	932.48	1285.71	1285.71			659.67	808.14
Capacity (c), veh/h					613.80	923.25	1272.98	1272.98			640.45	784.60
v/c Ratio (x)					0.42	0.11	0.46	0.32			0.42	0.19

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					12.2	4.9	7.6	5.8			11.7	6.6
Lane LOS					B	A	A	A			B	A
95% Queue, veh					2.1	0.4	2.5	1.4			2.1	0.7
Approach Delay, s/veh				10.2			6.8			9.9		
Approach LOS				B			A			A		
Intersection Delay, s/veh LOS	8.2						A					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 NB ramps & CTH J
E/W Street Name	I-41 NB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	I-41 NB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LT								T				LT			
Volume (V), veh/h	0	320	0	420					0		280	280	0	130	670	
Percent Heavy Vehicles, %	0	1	0	1					0		2	2	0	3	3	
Flow Rate (V_{PCE}), pc/h	0	359	0	471					0		317	317	0	149	767	
Right-Turn Bypass	Yielding				None				Yielding				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.2000	4.2000					4.2000	4.2000		4.2000	
Follow-Up Headway (s)		2.8000	2.8000					2.8000	2.8000		2.8000	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		359.00	471.00					317.00	317.00		916.00	
Entry Volume veh/h		355.45	466.34					310.78	310.78		889.32	
Circulating Flow (v_c), pc/h	916			676			508			0		
Exiting Flow (v_{ex}), pc/h	149			0			676			767		
Capacity (C_{PCE}), pc/h		630.57	708.05					866.06	1145.02		1285.71	
Capacity (c), veh/h		624.33	701.04					849.08	1122.57		1248.27	
v/c Ratio (x)		0.57	0.67					0.37	0.28		0.71	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		16.0	18.1					8.5	5.8		13.2	
Lane LOS		C	C					A	A		B	
95% Queue, veh		3.6	5.1					1.7	1.1		6.5	
Approach Delay, s/veh	17.1						7.2			13.2		
Approach LOS	C						A			B		
Intersection Delay, s/veh LOS	13.0						B					

HCS7 Roundabouts Report

General Information

Analyst	TPF
Agency or Co.	HNTB
Date Performed	6/19/2019
Analysis Year	2048
Time Analyzed	PM Build
Project Description	I-41 Appleton

Site Information

Intersection	I-41 SB ramps & CTH J
E/W Street Name	I-41 SB ramp
N/S Street Name	CTH J
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.78
Jurisdiction	I-41 SB & CTH J

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment							LT				LT				T	
Volume (V), veh/h					0	420	0	210	0	120	480		0		380	410
Percent Heavy Vehicles, %					0	4	0	4	0	1	1		0		7	7
Flow Rate (v_{pce}), pc/h					0	560	0	280	0	155	622		0		521	562
Right-Turn Bypass	None				Yielding				None				Yielding			
Conflicting Lanes					1				1				1			
Pedestrians Crossing, p/h					0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)					4.2000	4.2000		4.2000			4.2000	4.2000
Follow-Up Headway (s)					2.8000	2.8000		2.8000			2.8000	2.8000

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h					560.00	280.00		777.00			521.00	562.00
Entry Volume veh/h					538.46	269.23		769.31			486.92	525.23
Circulating Flow (v_c), pc/h	1081			777			0			715		
Exiting Flow (v_{ex}), pc/h	0			155			622			1081		
Capacity (c_{pce}), pc/h					702.56	792.58		1285.71			737.27	1139.69
Capacity (c), veh/h					675.54	762.09		1272.98			689.04	1065.13
v/c Ratio (x)					0.80	0.35		0.60			0.71	0.49

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh					26.9	9.0		10.1			20.3	9.1
Lane LOS					D	A		B			C	A
95% Queue, veh					8.0	1.6		4.3			5.9	2.8
Approach Delay, s/veh				20.9			10.1			14.5		
Approach LOS				C			B			B		
Intersection Delay, s/veh LOS	15.2						C					