



720 SW Washington St.
Suite 500
Portland, OR 97205
503.243.3500
www.dksassociates.com

Appendix

HCM Reports

Active Transportation Network Insets



HCM Reports

HCM Signalized Intersection Capacity Analysis

2: Pacific HWY W & Arnold Ave

05/07/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↖	↗		↖	↗	↖	↗	↖	↗
Traffic Volume (vph)	5	5	5	75	5	70	0	790	165	80	580	5
Future Volume (vph)	5	5	5	75	5	70	0	790	165	80	580	5
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt		0.95		1.00	0.86			1.00	0.85	1.00	1.00	
Flt Protected		0.98		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1644		1599	1451			1716	1458	1599	1665	
Flt Permitted		0.90		0.75	1.00			1.00	1.00	0.29	1.00	
Satd. Flow (perm)		1509		1258	1451			1716	1458	490	1665	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	5	5	5	77	5	71	0	806	168	82	592	5
RTOR Reduction (vph)	0	4	0	0	62	0	0	0	44	0	0	0
Lane Group Flow (vph)	0	11	0	77	14	0	0	806	124	82	597	0
Heavy Vehicles (%)	0%	0%	0%	4%	0%	4%	0%	2%	2%	4%	5%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		7.6		7.6	7.6			43.6	43.6	43.6	43.6	
Effective Green, g (s)		7.6		7.6	7.6			44.4	44.4	44.4	44.4	
Actuated g/C Ratio		0.13		0.13	0.13			0.74	0.74	0.74	0.74	
Clearance Time (s)		4.0		4.0	4.0			4.8	4.8	4.8	4.8	
Vehicle Extension (s)		2.5		2.5	2.5			2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)		191		159	183			1269	1078	362	1232	
v/s Ratio Prot					0.01			c0.47			0.36	
v/s Ratio Perm		0.01		c0.06					0.09	0.17		
v/c Ratio		0.06		0.48	0.08			0.64	0.12	0.23	0.48	
Uniform Delay, d1		23.0		24.4	23.1			3.8	2.2	2.4	3.2	
Progression Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		1.7	0.1			2.4	0.2	1.5	1.4	
Delay (s)		23.1		26.1	23.2			6.3	2.4	3.9	4.5	
Level of Service		C		C	C			A	A	A	A	
Approach Delay (s)		23.1			24.7			5.6			4.4	
Approach LOS		C			C			A			A	

Intersection Summary

HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

4: Pacific HWY W & Ryals Ave

05/07/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔		↔	↑	↔	↔	↔	↔
Traffic Volume (vph)	10	10	15	135	10	55	5	910	280	70	595	10
Future Volume (vph)	10	10	15	135	10	55	5	910	280	70	595	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.94		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1590		1662	1528		1662	1716	1488	1662	1661	
Flt Permitted		0.92		0.73	1.00		0.35	1.00	1.00	0.17	1.00	
Satd. Flow (perm)		1483		1282	1528		609	1716	1488	290	1661	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	11	16	147	11	60	5	989	304	76	647	11
RTOR Reduction (vph)	0	13	0	0	50	0	0	0	94	0	1	0
Lane Group Flow (vph)	0	25	0	147	21	0	5	989	210	76	657	0
Heavy Vehicles (%)	8%	0%	0%	0%	0%	0%	0%	2%	0%	0%	5%	10%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)		9.8		9.8	9.8		38.1	38.1	38.1	38.1	38.1	
Effective Green, g (s)		9.8		9.8	9.8		38.9	38.9	38.9	38.9	38.9	
Actuated g/C Ratio		0.17		0.17	0.17		0.69	0.69	0.69	0.69	0.69	
Clearance Time (s)		4.0		4.0	4.0		4.8	4.8	4.8	4.8	4.8	
Vehicle Extension (s)		2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lane Grp Cap (vph)		256		221	264		417	1177	1020	198	1139	
v/s Ratio Prot					0.01			c0.58				0.40
v/s Ratio Perm		0.02		c0.11			0.01		0.14	0.26		
v/c Ratio		0.10		0.67	0.08		0.01	0.84	0.21	0.38	0.58	
Uniform Delay, d1		19.7		21.9	19.7		2.8	6.6	3.3	3.8	4.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		6.6	0.1		0.0	5.5	0.1	0.9	0.6	
Delay (s)		19.8		28.5	19.8		2.8	12.1	3.3	4.7	5.2	
Level of Service		B		C	B		A	B	A	A	A	
Approach Delay (s)		19.8			25.7			10.0			5.2	
Approach LOS		B			C			A			A	

Intersection Summary

HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	56.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 5: Pacific Hwy W & Lewisburg Ave/Granger Ave

05/07/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	100	80	110	105	40	70	935	225	30	535	30
Future Volume (vph)	115	100	80	110	105	40	70	935	225	30	535	30
Ideal Flow (vphp)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.0	4.0	4.5	4.0	4.5	4.0	4.0	6.0	4.0	4.0	
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	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1630	1750	1473	1583	1733	1488	1630	1716	1473	1662	1670	
Flt Permitted	0.63	1.00	1.00	0.64	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1078	1750	1473	1071	1733	1488	1630	1716	1473	1662	1670	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	125	109	87	120	114	43	76	1016	245	33	582	33
RTOR Reduction (vph)	0	0	73	0	0	36	0	0	68	0	2	0
Lane Group Flow (vph)	125	109	14	120	114	7	76	1016	177	33	613	0
Heavy Vehicles (%)	2%	0%	1%	5%	1%	0%	2%	2%	1%	0%	4%	3%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)	14.8	14.8	14.8	14.8	14.8	14.8	7.5	60.2	60.2	2.1	54.8	
Effective Green, g (s)	14.8	15.3	15.3	14.8	15.3	14.8	8.0	62.2	60.2	2.6	56.8	
Actuated g/C Ratio	0.16	0.17	0.17	0.16	0.17	0.16	0.09	0.68	0.65	0.03	0.62	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	6.0	6.0	4.5	6.0	
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5.4	5.4	2.5	5.4	
Lane Grp Cap (vph)	173	290	244	172	287	239	141	1158	962	46	1029	
v/s Ratio Prot		0.06			0.07		c0.05	c0.59		0.02	0.37	
v/s Ratio Perm	c0.12		0.01	0.11		0.00			0.12			
v/c Ratio	0.72	0.38	0.06	0.70	0.40	0.03	0.54	0.88	0.18	0.72	0.60	
Uniform Delay, d1	36.7	34.2	32.3	36.5	34.3	32.6	40.3	11.9	6.3	44.4	10.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	13.1	0.6	0.1	10.8	0.7	0.0	3.1	8.5	0.2	39.2	1.5	
Delay (s)	49.8	34.8	32.4	47.3	34.9	32.6	43.3	20.4	6.5	83.6	12.2	
Level of Service	D	C	C	D	C	C	D	C	A	F	B	
Approach Delay (s)		40.0			39.9			19.2			15.9	
Approach LOS		D			D			B			B	

Intersection Summary		
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.84	
Actuated Cycle Length (s)	92.1	Sum of lost time (s) 12.0
Intersection Capacity Utilization	80.3%	ICU Level of Service D
Analysis Period (min)	15	
c Critical Lane Group		

Intersection			
Intersection Delay, s/veh	8.0		
Intersection LOS	A		
Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	109	479	407
Demand Flow Rate, veh/h	109	490	426
Vehicles Circulating, veh/h	398	29	87
Vehicles Exiting, veh/h	115	478	432
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	4	0	0
Ped Cap Adj	0.999	1.000	1.000
Approach Delay, s/veh	6.3	8.3	8.2
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	109	490	426
Cap Entry Lane, veh/h	759	1098	1036
Entry HV Adj Factor	1.000	0.978	0.956
Flow Entry, veh/h	109	479	407
Cap Entry, veh/h	759	1073	990
V/C Ratio	0.144	0.446	0.411
Control Delay, s/veh	6.3	8.3	8.2
LOS	A	A	A
95th %tile Queue, veh	1	2	2

HCM Signalized Intersection Capacity Analysis

14: US HWY 20 & Springhill Dr

05/07/2018



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑↑	↑↑	↗	↙↘	
Traffic Volume (vph)	60	2050	1760	850	645	35
Future Volume (vph)	60	2050	1760	850	645	35
Ideal Flow (vphp)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	1.00	0.85	0.99	
Flt Protected	0.95	1.00	1.00	1.00	0.95	
Satd. Flow (prot)	1662	3260	3292	1473	3124	
Flt Permitted	0.95	1.00	1.00	1.00	0.95	
Satd. Flow (perm)	1662	3260	3292	1473	3124	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	61	2092	1796	867	658	36
RTOR Reduction (vph)	0	0	0	145	3	0
Lane Group Flow (vph)	61	2092	1796	722	691	0
Confl. Peds. (#/hr)						1
Heavy Vehicles (%)	0%	2%	1%	1%	3%	0%
Turn Type	Prot	NA	NA	Perm	Prot	
Protected Phases	1	6	2		8	
Permitted Phases				2		
Actuated Green, G (s)	6.1	72.5	72.5	72.5	27.9	
Effective Green, g (s)	6.1	73.5	73.5	73.5	28.4	
Actuated g/C Ratio	0.05	0.61	0.61	0.61	0.24	
Clearance Time (s)	4.0	5.0	5.0	5.0	4.5	
Vehicle Extension (s)	2.5	5.0	6.0	6.0	2.5	
Lane Grp Cap (vph)	84	1996	2016	902	739	
v/s Ratio Prot	c0.04	c0.64	0.55		c0.22	
v/s Ratio Perm				0.49		
v/c Ratio	0.73	1.05	0.89	0.80	0.93	
Uniform Delay, d1	56.1	23.2	19.8	17.7	44.9	
Progression Factor	1.04	0.84	1.00	1.00	1.00	
Incremental Delay, d2	16.3	30.2	6.4	7.4	18.9	
Delay (s)	74.7	49.7	26.3	25.0	63.8	
Level of Service	E	D	C	C	E	
Approach Delay (s)		50.4	25.9		63.8	
Approach LOS		D	C		E	

Intersection Summary

HCM 2000 Control Delay	40.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: Takena Landing Park Rd/North Albany Rd & US HWY 20

05/07/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖		↕		↖	↗	↖
Traffic Volume (vph)	165	1530	5	5	1100	690	0	5	5	575	5	145
Future Volume (vph)	165	1530	5	5	1100	690	0	5	5	575	5	145
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0	2.3		3.5		3.5	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00		0.97	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		0.93		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00		0.95	1.00	
Satd. Flow (prot)	1614	3291		1662	3260	1473		1632		3131	1470	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00		0.75	1.00	
Satd. Flow (perm)	1614	3291		1662	3260	1473		1632		2476	1470	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	174	1611	5	5	1158	726	0	5	5	605	5	153
RTOR Reduction (vph)	0	0	0	0	0	147	0	5	0	0	145	0
Lane Group Flow (vph)	174	1616	0	5	1158	579	0	5	0	605	13	0
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	3%	1%	0%	0%	2%	1%	0%	0%	0%	3%	0%	0%
Turn Type	Prot	NA		Prot	NA	pm+ov		NA		pm+pt	NA	
Protected Phases	5	2		1	6	3		8		3	4	
Permitted Phases						6	8			4		
Actuated Green, G (s)	16.2	71.5		1.0	56.3	79.3		5.8		28.8	5.8	
Effective Green, g (s)	16.7	73.2		1.5	58.0	82.7		6.8		29.8	6.3	
Actuated g/C Ratio	0.14	0.61		0.01	0.48	0.69		0.06		0.25	0.05	
Clearance Time (s)	4.5	5.7		4.5	5.7	4.0		4.5		4.0	4.5	
Vehicle Extension (s)	2.5	4.7		2.5	4.7	2.5		2.5		2.5	2.5	
Lane Grp Cap (vph)	224	2007		20	1575	1015		92		743	77	
v/s Ratio Prot	0.11	c0.49		0.00	c0.36	0.12		0.00		c0.16	0.01	
v/s Ratio Perm						0.28				c0.04		
v/c Ratio	0.78	0.81		0.25	0.74	0.57		0.06		0.81	0.17	
Uniform Delay, d1	49.9	17.9		58.7	24.8	9.6		53.6		42.0	54.3	
Progression Factor	1.00	1.00		0.74	0.51	0.50		1.00		1.00	1.00	
Incremental Delay, d2	14.9	3.6		2.3	1.5	0.3		0.2		6.7	0.8	
Delay (s)	64.8	21.5		45.6	14.2	5.1		53.8		48.7	55.1	
Level of Service	E	C		D	B	A		D		D	E	
Approach Delay (s)		25.7			10.8			53.8			50.0	
Approach LOS		C			B			D			D	

Intersection Summary		
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.82	
Actuated Cycle Length (s)	120.0	Sum of lost time (s) 15.5
Intersection Capacity Utilization	84.7%	ICU Level of Service E
Analysis Period (min)	15	

c Critical Lane Group

Intersection

Int Delay, s/veh	1.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	225	1670	1080	145	35	65
Future Vol, veh/h	225	1670	1080	145	35	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	210	-	-	110	0	150
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	2	0	2
Mvmt Flow	245	1815	1174	158	38	71

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1332	0	-	0	2572
Stage 1	-	-	-	-	1174
Stage 2	-	-	-	-	1398
Critical Hdwy	4.12	-	-	-	6.8
Critical Hdwy Stg 1	-	-	-	-	5.8
Critical Hdwy Stg 2	-	-	-	-	5.8
Follow-up Hdwy	2.21	-	-	-	3.5
Pot Cap-1 Maneuver	519	-	-	-	22
Stage 1	-	-	-	-	260
Stage 2	-	-	-	-	198
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	519	-	-	-	12
Mov Cap-2 Maneuver	-	-	-	-	-91
Stage 1	-	-	-	-	137
Stage 2	-	-	-	-	198

Approach	EB	WB	SB
HCM Control Delay, s	2.1	0	
HCM LOS			-

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	519	-	-	-	+	453
HCM Lane V/C Ratio	0.471	-	-	-	-	0.156
HCM Control Delay (s)	18	-	-	-	-	14.4
HCM Lane LOS	C	-	-	-	-	B
HCM 95th %tile Q(veh)	2.5	-	-	-	-	0.5

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 4.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	↗
Traffic Vol, veh/h	115	1835	1010	135	60	50
Future Vol, veh/h	115	1835	1010	135	60	50
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	None
Storage Length	540	-	-	330	0	75
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	1	1	1	6	0
Mvmt Flow	125	1995	1098	147	65	54

Major/Minor

	Major1	Major2	Minor2
Conflicting Flow All	1099	0	0 2347 550
Stage 1	-	-	- 1099 -
Stage 2	-	-	- 1248 -
Critical Hdwy	4.1	-	- 6.92 6.9
Critical Hdwy Stg 1	-	-	- 5.92 -
Critical Hdwy Stg 2	-	-	- 5.92 -
Follow-up Hdwy	2.2	-	- 3.56 3.3
Pot Cap-1 Maneuver	643	-	0 ~ 29 484
Stage 1	-	-	0 272 -
Stage 2	-	-	0 226 -
Platoon blocked, %	-	-	
Mov Cap-1 Maneuver	642	-	- ~ 23 484
Mov Cap-2 Maneuver	-	-	- 72 -
Stage 1	-	-	- 219 -
Stage 2	-	-	- 226 -

Approach

	EB	WB	SB
HCM Control Delay, s	0.7	0	103.2
HCM LOS			F

Minor Lane/Major Mvmt

	EBL	EBT	WBT	SBLn1	SBLn2
Capacity (veh/h)	642	-	-	72	484
HCM Lane V/C Ratio	0.195	-	-	0.906	0.112
HCM Control Delay (s)	12	-	-	178.1	13.4
HCM Lane LOS	B	-	-	F	B
HCM 95th %tile Q(veh)	0.7	-	-	4.5	0.4

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 TWSC
 18: US HWY 20 & Granger Ave/Autumn Seed Drwy

05/07/2018

Intersection												
Int Delay, s/veh	6.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↖	↑↑	↖		↑↑	↗
Traffic Vol, veh/h	130	0	15	0	0	5	20	1815	5	0	870	195
Future Vol, veh/h	130	0	15	0	0	5	20	1815	5	0	870	195
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	-	-	15	-	-	-	445	-	150	-	-	339
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	0	0	0	0	1	0	0	1	2
Mvmt Flow	140	0	16	0	0	5	22	1952	5	0	935	210

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1955	2936	468	2464	3141	976	1145	0	0	-	-	0
Stage 1	935	935	-	1996	1996	-	-	-	-	-	-	-
Stage 2	1020	2001	-	468	1145	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.5	6.5	6.9	4.1	-	-	-	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	-	-	-
Pot Cap-1 Maneuver	~ 39	15	547	16	11	254	618	-	-	0	-	-
Stage 1	289	347	-	63	106	-	-	-	-	0	-	-
Stage 2	257	106	-	550	277	-	-	-	-	0	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 37	14	547	15	11	254	618	-	-	-	-	-
Mov Cap-2 Maneuver	~ 135	76	-	52	71	-	-	-	-	-	-	-
Stage 1	279	347	-	61	102	-	-	-	-	-	-	-
Stage 2	243	102	-	534	277	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB			
HCM Control Delay, s	137		19.5		0.1		0			
HCM LOS	F		C							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBT	SBR
Capacity (veh/h)	618	-	-	135	547	254	-	-
HCM Lane V/C Ratio	0.035	-	-	1.035	0.029	0.021	-	-
HCM Control Delay (s)	11	-	-	151.4	11.8	19.5	-	-
HCM Lane LOS	B	-	-	F	B	C	-	-
HCM 95th %tile Q(veh)	0.1	-	-	7.5	0.1	0.1	-	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

**Intersection Level Of Service Report
Intersection 4: US20/OR34 & 53rd St**

Control Type: Signalized
Analysis Method: HCM 2000
Analysis Period: 15 minutes

Delay (sec / veh): 63.4
Level Of Service: E
Volume to Capacity (v/c): 0.887

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	0	1	0	0	1	0	1
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	35.00			45.00			45.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	132	288	92	253	270	115	121	788	81	155	897	385
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	0.00	2.00	2.00	0.00	5.00	4.00	2.00	1.00	4.00	1.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	8	0	0	11	0	0	9	0	0	65
Total Hourly Volume [veh/h]	132	288	84	253	270	104	121	788	72	155	897	320
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	34	73	21	65	69	27	31	201	18	40	229	82
Total Analysis Volume [veh/h]	135	294	86	258	276	106	123	804	73	158	915	327
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrian Volume [ped/h]	0			16			0			16		
Bicycle Volume [bicycles/h]	2			1			1			1		

Intersection				
Intersection Delay, s/veh15.2				
Intersection LOS C				
Approach	EB	NB	SB	
Entry Lanes	1	1	1	
Conflicting Circle Lanes	1	1	1	
Adj Approach Flow, veh/h	416	562	1063	
Demand Flow Rate, veh/h	424	569	1082	
Vehicles Circulating, veh/h	626	393	11	
Vehicles Exiting, veh/h	11	657	951	
Follow-Up Headway, s	3.186	3.186	3.186	
Ped Vol Crossing Leg, #/h	13	0	20	
Ped Cap Adj	0.998	1.000	0.997	
Approach Delay, s/veh	22.7	21.1	9.1	
Approach LOS	C	C	A	
Lane	Left	Left	Left	Bypass
Designated Moves	LR	LT	T	R
Assumed Moves	LR	LT	T	R
RT Channelized				Yield
Lane Util	1.000	1.000	1.000	
Critical Headway, s	5.193	5.193	5.193	
Entry Flow, veh/h	424	569	626	456
Cap Entry Lane, veh/h	604	763	1118	1118
Entry HV Adj Factor	0.981	0.989	0.990	0.971
Flow Entry, veh/h	416	562	620	443
Cap Entry, veh/h	592	754	1103	1082
V/C Ratio	0.703	0.746	0.562	0.409
Control Delay, s/veh	22.7	21.1	10.2	7.7
LOS	C	C	B	A
95th %tile Queue, veh	6	7	4	2

Intersection				
Intersection Delay, s/veh	6.9			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	169	136	240	385
Demand Flow Rate, veh/h	175	138	240	394
Vehicles Circulating, veh/h	351	291	221	60
Vehicles Exiting, veh/h	103	170	305	369
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	2	2
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.1	6.0	6.7	7.3
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	175	138	240	394
Cap Entry Lane, veh/h	795	845	906	1064
Entry HV Adj Factor	0.964	0.986	1.000	0.978
Flow Entry, veh/h	169	136	240	385
Cap Entry, veh/h	767	832	906	1040
V/C Ratio	0.220	0.163	0.265	0.370
Control Delay, s/veh	7.1	6.0	6.7	7.3
LOS	A	A	A	A
95th %tile Queue, veh	1	1	1	2

Intersection			
Intersection Delay, s/veh18.1			
Intersection LOS C			
Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	78	844	781
Demand Flow Rate, veh/h	78	868	789
Vehicles Circulating, veh/h	781	70	39
Vehicles Exiting, veh/h	47	789	899
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.9	21.6	15.3
Approach LOS	A	C	C
Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	78	868	789
Cap Entry Lane, veh/h	517	1054	1087
Entry HV Adj Factor	1.000	0.972	0.990
Flow Entry, veh/h	78	844	781
Cap Entry, veh/h	517	1024	1076
V/C Ratio	0.151	0.824	0.726
Control Delay, s/veh	8.9	21.6	15.3
LOS	A	C	C
95th %tile Queue, veh	1	10	7

Intersection				
Intersection Delay, s/veh	9.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	489	538	186	0
Demand Flow Rate, veh/h	501	551	186	0
Vehicles Circulating, veh/h	13	170	381	721
Vehicles Exiting, veh/h	708	397	133	0
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.2	11.9	7.3	0.0
Approach LOS	A	B	A	-
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	501	551	186	0
Cap Entry Lane, veh/h	1115	953	772	549
Entry HV Adj Factor	0.975	0.977	1.000	1.000
Flow Entry, veh/h	489	538	186	0
Cap Entry, veh/h	1088	932	772	549
V/C Ratio	0.449	0.578	0.241	0.000
Control Delay, s/veh	8.2	11.9	7.3	6.6
LOS	A	B	A	A
95th %tile Queue, veh	2	4	1	0

Intersection				
Intersection Delay, s/veh	5.3			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	74	111	122	185
Demand Flow Rate, veh/h	80	111	138	200
Vehicles Circulating, veh/h	184	149	106	90
Vehicles Exiting, veh/h	106	95	158	170
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	1
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.9	4.7	5.3	5.6
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	80	111	138	200
Cap Entry Lane, veh/h	940	974	1016	1033
Entry HV Adj Factor	0.930	1.000	0.881	0.924
Flow Entry, veh/h	74	111	122	185
Cap Entry, veh/h	874	974	896	954
V/C Ratio	0.085	0.114	0.136	0.194
Control Delay, s/veh	4.9	4.7	5.3	5.6
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	1

Intersection

Intersection Delay, s/veh	21.8
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Traffic Vol, veh/h	135	292	43	30	152	188	49	61	85	183	27	65
Future Vol, veh/h	135	292	43	30	152	188	49	61	85	183	27	65
Peak Hour Factor	0.92	0.92	0.92	0.90	0.92	0.90	0.92	0.90	0.90	0.90	0.90	0.92
Heavy Vehicles, %	2	2	2	0	2	3	2	2	0	4	7	2
Mvmt Flow	147	317	47	33	165	209	53	68	94	203	30	71
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	24	26.6	14.4	16.9
HCM LOS	C	D	B	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	42%	0%	87%	0%	45%	0%	29%
Vol Right, %	0%	58%	0%	13%	0%	55%	0%	71%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	49	146	135	335	30	340	183	92
LT Vol	49	0	135	0	30	0	183	0
Through Vol	0	61	0	292	0	152	0	27
RT Vol	0	85	0	43	0	188	0	65
Lane Flow Rate	53	162	147	364	33	374	203	101
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.13	0.354	0.321	0.736	0.074	0.742	0.483	0.212
Departure Headway (Hd)	8.793	7.853	7.887	7.281	8.018	7.141	8.548	7.574
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	406	456	455	495	445	505	421	472
Service Time	6.581	5.64	5.663	5.057	5.793	4.916	6.329	5.354
HCM Lane V/C Ratio	0.131	0.355	0.323	0.735	0.074	0.741	0.482	0.214
HCM Control Delay	12.9	14.9	14.4	27.9	11.4	27.9	19.1	12.4
HCM Lane LOS	B	B	B	D	B	D	C	B
HCM 95th-tile Q	0.4	1.6	1.4	6.1	0.2	6.2	2.6	0.8



Map Figures at Additional Zoom Levels