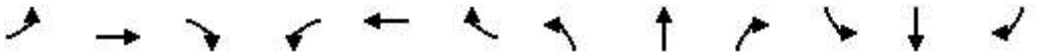
ATTACHMENT H | IMPROVED SIGNALS CONCEPT – 2040 TRAFFIC OPERATIONS WORKSHEETS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	156	19	26	26	531	12	499	61	451	322	124
Future Volume (vph)	87	156	19	26	26	531	12	499	61	451	322	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95		1.00	1.00	
Frpb, ped/bikes		1.00			1.00	1.00	1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.99			1.00	0.85	1.00	0.98		1.00	0.96	
Flt Protected		0.98			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1835			1648	1553	1805	3510		1504	1691	
Flt Permitted		0.98			0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1835			1648	1553	1805	3510		1504	1691	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	93	166	20	28	28	565	13	531	65	480	343	132
RTOR Reduction (vph)	0	2	0	0	0	0	0	7	0	0	8	0
Lane Group Flow (vph)	0	277	0	0	56	565	13	589	0	480	467	0
Confl. Peds. (#/hr)			2	2			3		1	1		3
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	2%	0%	0%	0%	25%	4%	0%	1%	0%	20%	1%	22%
Turn Type	Split	NA		Split	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8	1	5	2		1	6	
Permitted Phases						8						
Actuated Green, G (s)		22.3			8.1	64.0	2.1	18.6		55.9	72.4	
Effective Green, g (s)		22.3			8.1	64.0	2.1	18.6		55.9	72.4	
Actuated g/C Ratio		0.18			0.07	0.52	0.02	0.15		0.45	0.59	
Clearance Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		332			108	808	30	531		684	996	
v/s Ratio Prot		c0.15			0.03	c0.32	0.01	c0.17		c0.32	0.28	
v/s Ratio Perm						0.05						
v/c Ratio		0.84			0.52	0.70	0.43	1.11		0.70	0.47	
Uniform Delay, d1		48.5			55.5	22.2	59.8	52.1		26.8	14.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		16.4			4.2	2.7	9.7	72.6		5.9	0.4	
Delay (s)		64.9			59.7	24.9	69.5	124.8		32.8	14.7	
Level of Service		E			E	C	E	F		C	B	
Approach Delay (s)		64.9			28.0			123.6			23.8	
Approach LOS		E			C			F			C	

Intersection Summary			
HCM 2000 Control Delay	54.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	122.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	156	19	26	26	531	12	499	61	451	322	124
Future Volume (veh/h)	87	156	19	26	26	531	12	499	61	451	322	124
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.97	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	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1900	1900	1900	1530	1841	1900	1885	1900	1604	1885	1574
Adj Flow Rate, veh/h	93	166	18	28	28	565	13	531	58	480	343	123
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
Percent Heavy Veh, %	2	0	0	0	25	4	0	1	0	20	1	22
Cap, veh/h	106	189	21	59	59	812	27	506	55	676	773	277
Arrive On Green	0.17	0.17	0.17	0.08	0.08	0.08	0.01	0.16	0.16	0.44	0.58	0.58
Sat Flow, veh/h	620	1107	120	746	746	1548	1810	3246	353	1527	1324	475
Grp Volume(v), veh/h	277	0	0	56	0	565	13	292	297	480	0	466
Grp Sat Flow(s),veh/h/ln	1847	0	0	1492	0	1548	1810	1791	1808	1527	0	1798
Q Serve(g_s), s	17.3	0.0	0.0	4.3	0.0	0.0	0.8	18.5	18.5	30.3	0.0	17.3
Cycle Q Clear(g_c), s	17.3	0.0	0.0	4.3	0.0	0.0	0.8	18.5	18.5	30.3	0.0	17.3
Prop In Lane	0.34		0.06	0.50		1.00	1.00		0.20	1.00		0.26
Lane Grp Cap(c), veh/h	316	0	0	117	0	812	27	279	282	676	0	1050
V/C Ratio(X)	0.88	0.00	0.00	0.48	0.00	0.70	0.49	1.05	1.05	0.71	0.00	0.44
Avail Cap(c_a), veh/h	397	0	0	321	0	1023	84	279	282	676	0	1050
HCM Platoon Ratio	1.00	1.00	1.00	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	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	47.9	0.0	0.0	52.3	0.0	21.3	58.0	50.1	50.1	26.9	0.0	13.9
Incr Delay (d2), s/veh	16.4	0.0	0.0	3.0	0.0	1.5	13.3	66.4	68.1	6.2	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.4	0.0	0.0	3.1	0.0	17.4	0.9	19.8	20.2	17.7	0.0	11.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.3	0.0	0.0	55.3	0.0	22.8	71.2	116.5	118.2	33.1	0.0	14.2
LnGrp LOS	E	A	A	E	A	C	E	F	F	C	A	B
Approach Vol, veh/h		277			621			602			946	
Approach Delay, s/veh		64.3			25.8			116.3			23.8	
Approach LOS		E			C			F			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	57.0	23.0		24.8	6.2	73.8		13.8				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	52.5	18.5		25.5	5.5	65.5		25.5				
Max Q Clear Time (g_c+I1), s	32.3	20.5		19.3	2.8	19.3		6.3				
Green Ext Time (p_c), s	1.6	0.0		0.8	0.0	3.5		2.5				

Intersection Summary			
HCM 6th Ctrl Delay		51.6	
HCM 6th LOS		D	

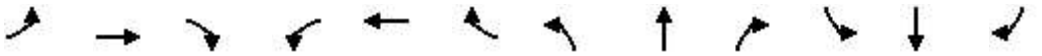
Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	731	329	378	814	222	0	0	0	468	247	83
Future Volume (vph)	57	731	329	378	814	222	0	0	0	468	247	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5					4.5	4.5	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95					0.97	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99					1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00					1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97					1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00					0.95	1.00	
Satd. Flow (prot)	1805	3574	1562	1703	3297					3400	1750	
Flt Permitted	0.15	1.00	1.00	0.95	1.00					0.95	1.00	
Satd. Flow (perm)	276	3574	1562	1703	3297					3400	1750	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	59	761	343	394	848	231	0	0	0	488	257	86
RTOR Reduction (vph)	0	0	260	0	19	0	0	0	0	0	10	0
Lane Group Flow (vph)	59	761	83	394	1060	0	0	0	0	488	333	0
Confl. Peds. (#/hr)	3		1	1		3						
Heavy Vehicles (%)	0%	1%	2%	6%	6%	3%	0%	0%	0%	3%	6%	0%
Turn Type	pm+pt	NA	Perm	Prot	NA					Perm	NA	
Protected Phases	7	2		1	2 1						4 12	
Permitted Phases	2		2							4 12		
Actuated Green, G (s)	31.9	27.5	27.5	35.8	67.8					34.6	34.6	
Effective Green, g (s)	31.9	27.5	27.5	35.8	67.8					34.6	34.6	
Actuated g/C Ratio	0.27	0.23	0.23	0.30	0.56					0.29	0.29	
Clearance Time (s)	4.5	4.5	4.5	4.5								
Vehicle Extension (s)	3.0	3.0	3.0	3.0								
Lane Grp Cap (vph)	129	816	357	506	1858					977	503	
v/s Ratio Prot	c0.02	c0.21		c0.23	0.32						c0.19	
v/s Ratio Perm	0.10		0.05							0.14		
v/c Ratio	0.46	0.93	0.23	0.78	0.57					0.50	0.66	
Uniform Delay, d1	53.7	45.5	37.8	38.6	16.9					35.6	37.7	
Progression Factor	1.00	1.00	1.00	1.00	0.43					1.00	1.00	
Incremental Delay, d2	2.6	17.3	0.3	4.9	0.3					0.4	3.3	
Delay (s)	56.3	62.8	38.1	43.5	7.6					36.1	41.0	
Level of Service	E	E	D	D	A					D	D	
Approach Delay (s)		55.2			17.2			0.0			38.1	
Approach LOS		E			B			A			D	

Intersection Summary			
HCM 2000 Control Delay	34.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.3	Sum of lost time (s)	22.5
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



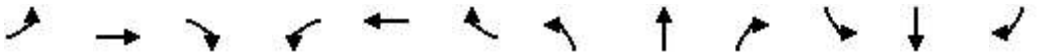
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	457	743	0	0	682	213	381	98	417	87	0	352
Future Volume (vph)	457	743	0	0	682	213	381	98	417	87	0	352
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5		4.5	4.5	4.5	4.5		4.5
Lane Util. Factor	1.00	0.95			0.95		0.97	1.00	1.00	1.00		1.00
Frt	1.00	1.00			0.96		1.00	1.00	0.85	1.00		0.85
Flt Protected	0.95	1.00			1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (prot)	1770	3539			3413		3433	1863	1583	1770		1583
Flt Permitted	0.95	1.00			1.00		0.95	1.00	1.00	0.95		1.00
Satd. Flow (perm)	1770	3539			3413		3433	1863	1583	1770		1583
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)	481	782	0	0	718	224	401	103	439	92	0	371
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	179	0	0	157
Lane Group Flow (vph)	481	782	0	0	917	0	401	103	260	92	0	214
Turn Type	Prot	NA			NA		Perm	NA	Perm	Prot		Over
Protected Phases	5	6 5			6			8 16		3		5
Permitted Phases							8 16		8 16			
Actuated Green, G (s)	33.5	70.8			37.3		21.5	21.5	21.5	10.0		33.5
Effective Green, g (s)	33.5	70.8			37.3		21.5	21.5	21.5	10.0		33.5
Actuated g/C Ratio	0.28	0.59			0.31		0.18	0.18	0.18	0.08		0.28
Clearance Time (s)	4.5				4.5					4.5		4.5
Vehicle Extension (s)	3.0				3.0					3.0		3.0
Lane Grp Cap (vph)	492	2082			1058		613	332	282	147		440
v/s Ratio Prot	c0.27	0.22			c0.27			0.06		c0.05		0.14
v/s Ratio Perm							0.12		c0.16			
v/c Ratio	0.98	0.38			0.87		0.65	0.31	0.92	0.63		0.49
Uniform Delay, d1	43.0	13.1			39.2		45.9	43.0	48.6	53.3		36.2
Progression Factor	0.80	0.34			1.00		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	27.3	0.1			7.6		2.5	0.5	33.6	8.1		0.9
Delay (s)	61.7	4.5			46.8		48.5	43.5	82.2	61.4		37.1
Level of Service	E	A			D		D	D	F	E		D
Approach Delay (s)		26.3			46.8			63.6			41.9	
Approach LOS		C			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	43.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.3	Sum of lost time (s)	22.5
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	0	27	259	1	108	34	1003	208	147	609	12
Future Volume (vph)	8	0	27	259	1	108	34	1003	208	147	609	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.95	0.95		1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.85		1.00	0.91		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	0.98		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1455		1715	1552		1703	3539	1455	1736	3399	
Flt Permitted	0.95	1.00		0.95	0.98		0.40	1.00	1.00	0.16	1.00	
Satd. Flow (perm)	1805	1455		1715	1552		713	3539	1455	290	3399	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	9	0	29	278	1	116	37	1078	224	158	655	13
RTOR Reduction (vph)	0	28	0	0	84	0	0	0	82	0	2	0
Lane Group Flow (vph)	9	1	0	206	105	0	37	1078	142	158	666	0
Heavy Vehicles (%)	0%	0%	11%	0%	100%	5%	6%	2%	11%	4%	6%	0%
Turn Type	Split	NA		Split	NA		pm+pt	NA	pt+ov	pm+pt	NA	
Protected Phases	4	4		8	8		5	2	2 8	1	6	
Permitted Phases							2			6		
Actuated Green, G (s)	2.0	2.0		14.0	14.0		28.1	28.1	42.1	31.4	31.4	
Effective Green, g (s)	2.0	2.0		14.0	14.0		28.1	28.1	42.1	31.4	31.4	
Actuated g/C Ratio	0.03	0.03		0.21	0.21		0.42	0.42	0.63	0.47	0.47	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	54	43		362	327		345	1499	923	272	1609	
v/s Ratio Prot	c0.00	0.00		c0.12	0.07		0.00	c0.30	0.10	c0.05	0.20	
v/s Ratio Perm							0.04			0.22		
v/c Ratio	0.17	0.02		0.57	0.32		0.11	0.72	0.15	0.58	0.41	
Uniform Delay, d1	31.3	31.2		23.4	22.1		11.6	15.8	4.9	12.9	11.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.5	0.2		2.1	0.6		0.1	1.7	0.1	3.1	0.2	
Delay (s)	32.8	31.4		25.5	22.7		11.7	17.5	5.0	16.0	11.6	
Level of Service	C	C		C	C		B	B	A	B	B	
Approach Delay (s)		31.7			24.2			15.3			12.4	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	66.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	0	27	259	1	108	34	1003	208	147	609	12
Future Volume (veh/h)	8	0	27	259	1	108	34	1003	208	147	609	12
Initial Q (Qb), veh	0	0	0	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	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	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1900	1737	1900	418	1826	1811	1870	1737	1841	1811	1900
Adj Flow Rate, veh/h	9	0	0	303	0	0	37	1078	136	158	655	11
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
Percent Heavy Veh, %	0	0	11	0	100	5	6	2	11	4	6	0
Cap, veh/h	21	22	0	499	58	0	604	1493	821	327	979	16
Arrive On Green	0.01	0.00	0.00	0.14	0.00	0.00	0.24	0.42	0.42	0.10	0.28	0.28
Sat Flow, veh/h	1810	1900	0	3619	418	0	1725	3554	1472	1753	3463	58
Grp Volume(v), veh/h	9	0	0	303	0	0	37	1078	136	158	325	341
Grp Sat Flow(s),veh/h/ln	1810	1900	0	1810	418	0	1725	1777	1472	1753	1721	1801
Q Serve(g_s), s	0.2	0.0	0.0	3.8	0.0	0.0	0.0	12.3	2.2	3.7	8.2	8.2
Cycle Q Clear(g_c), s	0.2	0.0	0.0	3.8	0.0	0.0	0.0	12.3	2.2	3.7	8.2	8.2
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	21	22	0	499	58	0	604	1493	821	327	486	509
V/C Ratio(X)	0.42	0.00	0.00	0.61	0.00	0.00	0.06	0.72	0.17	0.48	0.67	0.67
Avail Cap(c_a), veh/h	222	233	0	1926	222	0	604	1892	986	363	881	922
HCM Platoon Ratio	1.00	1.00	1.00	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	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.0	0.0	0.0	19.8	0.0	0.0	12.7	11.8	5.3	15.9	15.5	15.5
Incr Delay (d2), s/veh	12.7	0.0	0.0	1.2	0.0	0.0	0.0	1.0	0.1	1.1	1.6	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	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.0	0.0	2.8	0.0	0.0	0.5	7.3	1.4	2.5	5.3	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.7	0.0	0.0	21.0	0.0	0.0	12.7	12.8	5.4	17.0	17.1	17.0
LnGrp LOS	D	A	A	C	A	A	B	B	A	B	B	B
Approach Vol, veh/h		9			303			1251			824	
Approach Delay, s/veh		36.7			21.0			12.0			17.1	
Approach LOS		D			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.0	24.5		4.6	15.7	17.8		10.7				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	6.0	26.0		6.0	7.0	25.0		26.0				
Max Q Clear Time (g_c+I1), s	5.7	14.3		2.2	2.0	10.2		5.8				
Green Ext Time (p_c), s	0.0	6.2		0.0	0.0	3.6		1.0				

Intersection Summary		
HCM 6th Ctrl Delay		15.0
HCM 6th LOS		B

Notes

User approved pedestrian interval to be less than phase max green.

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	179	0	0	0	367	0	0	0	321	0	0
Future Vol, veh/h	0	179	0	0	0	367	0	0	0	321	0	0
Conflicting Peds, #/hr	0	0	5	5	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16983	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	3	3	5	6	2	10	2	4	2	2	2
Mvmt Flow	0	192	0	0	0	395	0	0	0	345	0	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	197	197	192	197	-
Stage 1	-	-	-	-	197	-	0	0	-
Stage 2	-	-	-	-	0	-	192	197	-
Critical Hdwy	-	-	-	-	6.52	6.24	7.12	6.52	-
Critical Hdwy Stg 1	-	-	-	-	5.52	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	-	-	-	-	4.018	3.336	3.518	4.018	-
Pot Cap-1 Maneuver	0	-	-	0	699	839	768	699	0
Stage 1	0	-	-	0	738	-	-	-	0
Stage 2	0	-	-	0	-	-	810	738	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	-	-	-	-	696	835	768	696	-
Mov Cap-2 Maneuver	-	-	-	-	696	-	768	696	-
Stage 1	-	-	-	-	734	-	-	-	-
Stage 2	-	-	-	-	-	-	810	734	-

Approach	EB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS		A	A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	0	-	-	0
HCM Lane LOS	A	-	-	A
HCM 95th %tile Q(veh)	-	-	-	-

Intersection: 2: Goerig St & Lakeshore Dr/Buckeye St

Movement	EB	WB	WB	B26	NB	NB	NB	B22	SB	SB
Directions Served	LTR	LT	R	T	L	T	TR	T	L	TR
Maximum Queue (ft)	646	878	175	567	159	276	282	1222	350	349
Average Queue (ft)	373	629	172	287	33	250	259	1098	251	174
95th Queue (ft)	744	1189	194	977	125	298	296	1469	378	351
Link Distance (ft)	736	891		1029		204	204	1166	318	318
Upstream Blk Time (%)	7	39		17		61	72	81	6	2
Queuing Penalty (veh)	0	0		0		0	0	0	29	8
Storage Bay Dist (ft)			100		100					
Storage Blk Time (%)		2	68			87				
Queuing Penalty (veh)		11	35			11				

Intersection: 3: I-5 SB On Ramp / SR 503

Movement	EB	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	L	TR
Maximum Queue (ft)	200	343	375	275	185	442	443	236	249	353
Average Queue (ft)	112	302	321	215	175	320	297	142	140	198
95th Queue (ft)	253	363	392	385	208	490	490	221	218	326
Link Distance (ft)		318	318			400	400			359
Upstream Blk Time (%)		8	18			5	3			1
Queuing Penalty (veh)		44	100			33	24			4
Storage Bay Dist (ft)	100			250	125			300	300	
Storage Blk Time (%)	0	74	30	0	41	13		0	0	3
Queuing Penalty (veh)	1	42	99	1	167	50		1	0	12

Intersection: 4: I-5 NB Off Ramp / SR 503

Movement	EB	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	T	T	TR	L	L	T	R	L	R
Maximum Queue (ft)	150	433	449	406	399	264	309	460	457	225	796
Average Queue (ft)	144	254	180	378	370	154	158	99	265	150	491
95th Queue (ft)	166	465	416	413	400	240	270	391	486	287	906
Link Distance (ft)		400	400	361	361			1192			1474
Upstream Blk Time (%)		2	1	41	41						
Queuing Penalty (veh)		9	5	182	185						
Storage Bay Dist (ft)	125					400	400		400	200	
Storage Blk Time (%)	58	0							9	1	54
Queuing Penalty (veh)	217	1							43	4	46

Intersection: 5: Lewis River Rd & Millard St

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	LTR	L	T	T	R	L	T	TR
Maximum Queue (ft)	30	78	270	382	103	343	370	225	325	1180	1164
Average Queue (ft)	5	24	103	172	12	172	185	62	222	633	625
95th Queue (ft)	20	63	230	359	60	310	335	220	431	1286	1260
Link Distance (ft)		568		474		361	361			1234	1234
Upstream Blk Time (%)				2		0	1			10	10
Queuing Penalty (veh)				8		0	5			0	0
Storage Bay Dist (ft)	100		170		300			200	300		
Storage Blk Time (%)		0	4	19	0	2	10	0	0	58	
Queuing Penalty (veh)		0	9	24	0	1	21	0	0	84	

Intersection: 6: E CC St & Lewis River Rd

Movement	WB	SB
Directions Served	R	LT
Maximum Queue (ft)	85	101
Average Queue (ft)	11	50
95th Queue (ft)	101	85
Link Distance (ft)	1449	474
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: I-5 SB On Ramp

Movement	SB
Directions Served	T
Maximum Queue (ft)	131
Average Queue (ft)	8
95th Queue (ft)	64
Link Distance (ft)	1294
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 17: I-5 SB On Ramp

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	78	101
Average Queue (ft)	12	11
95th Queue (ft)	48	54
Link Distance (ft)	342	342
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1516

ATTACHMENT I | ROUNDABOUTS CONCEPT

Roundabouts Concept Design

Preliminary Design Subject to Change
Date: 2/4/2020

Scale: 1" = 80'
80 40 0 80

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Anthony Yi, PE, Caleb Cox

I-5 at SR 503 Interchange Improvements
Woodland, WA