TECHNICAL APPENDIX C

Level of Service Results

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	1	86	10	3	63
Future Volume (Veh/h)	2	1	86	10	3	63
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.72	0.72	0.82	0.82
Hourly flow rate (vph)	4	2	119	14	4	77
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	211	126			133	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	211	126			133	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	775	924			1452	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	6	133	81
Volume Left	4	0	4
Volume Right	2	14	0
cSH	819	1700	1452
Volume to Capacity	0.01	0.08	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	9.4	0.0	0.4
Lane LOS	A		A
Approach Delay (s)	9.4	0.0	0.4
Approach LOS	A		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	15.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1	12	7	17	10	7	355	4	19	857	4
Future Volume (vph)	3	1	12	7	17	10	7	355	4	19	857	4
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.94		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1610		1770	1756		1770	3534		1770	3537	
Flt Permitted	0.98	1.00		0.98	1.00		0.23	1.00		0.51	1.00	
Satd. Flow (perm)	1817	1610		1817	1756		427	3534		944	3537	
Peak-hour factor, PHF	0.64	0.64	0.64	0.80	0.80	0.80	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	5	2	19	9	21	12	8	394	4	25	1143	5
RTOR Reduction (vph)	0	18	0	0	12	0	0	1	0	0	0	0
Lane Group Flow (vph)	5	3	0	9	22	0	8	397	0	25	1148	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.1	4.1		4.1	4.1		53.3	52.3		55.5	53.4	
Effective Green, g (s)	4.1	4.1		4.1	4.1		53.3	52.3		55.5	53.4	
Actuated g/C Ratio	0.06	0.06		0.06	0.06		0.74	0.73		0.77	0.74	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	103	91		103	99		334	2567		751	2623	
v/s Ratio Prot		0.00			c0.01		0.00	0.11		c0.00	c0.32	
v/s Ratio Perm	0.00			0.00			0.02			0.02		
v/c Ratio	0.05	0.03		0.09	0.22		0.02	0.15		0.03	0.44	
Uniform Delay, d1	32.1	32.1		32.2	32.4		2.5	3.0		1.9	3.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.4	1.1		0.0	0.1		0.0	0.5	
Delay (s)	32.3	32.2		32.5	33.5		2.6	3.2		1.9	4.1	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		32.2			33.3			3.2			4.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	72.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	147	19	28	71	11	17	31	10	29	69	24
Future Volume (Veh/h)	0	147	19	28	71	11	17	31	10	29	69	24
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.71	0.71	0.71	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	0	173	22	39	100	15	21	39	13	36	86	30
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	115			195			442	377	184	402	380	108
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	115			195			442	377	184	402	380	108
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			95	93	98	93	84	97
cM capacity (veh/h)	1474			1378			437	539	858	509	536	946

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	195	154	73	152
Volume Left	0	39	21	36
Volume Right	22	15	13	30
cSH	1474	1378	538	578
Volume to Capacity	0.00	0.03	0.14	0.26
Queue Length 95th (ft)	0	2	12	26
Control Delay (s)	0.0	2.1	12.7	13.4
Lane LOS		A	B	B
Approach Delay (s)	0.0	2.1	12.7	13.4
Approach LOS			B	B

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	94	123	43	40	12	323	257	20	82	645	29
Future Volume (vph)	51	94	123	43	40	12	323	257	20	82	645	29
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1831	1385		1816	1385	1770	3501		1770	3516	
Flt Permitted		0.76	1.00		0.57	1.00	0.13	1.00		0.53	1.00	
Satd. Flow (perm)		1421	1385		1063	1385	246	3501		986	3516	
Peak-hour factor, PHF	0.68	0.68	0.68	0.50	0.50	0.50	0.74	0.74	0.74	0.69	0.69	0.69
Adj. Flow (vph)	75	138	181	86	80	24	436	347	27	119	935	42
RTOR Reduction (vph)	0	0	145	0	0	19	0	7	0	0	4	0
Lane Group Flow (vph)	0	213	36	0	166	5	436	367	0	119	973	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		14.2	14.2		14.2	14.2	47.4	38.3		31.7	27.1	
Effective Green, g (s)		14.2	14.2		14.2	14.2	47.4	38.3		31.7	27.1	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.67	0.54		0.45	0.38	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		285	278		213	278	506	1899		493	1349	
v/s Ratio Prot							c0.19	0.10		0.02	0.28	
v/s Ratio Perm		0.15	0.03		c0.16	0.00	c0.39			0.09		
v/c Ratio		0.75	0.13		0.78	0.02	0.86	0.19		0.24	0.72	
Uniform Delay, d1		26.5	23.1		26.7	22.6	16.8	8.3		11.5	18.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		10.2	0.2		16.4	0.0	14.0	0.2		0.3	3.4	
Delay (s)		36.7	23.4		43.1	22.6	30.8	8.5		11.7	21.9	
Level of Service		D	C		D	C	C	A		B	C	
Approach Delay (s)		30.6			40.5			20.5			20.8	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	23.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	70.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	378	27	4	440	8	23	51	15	7	46	15
Future Volume (Veh/h)	35	378	27	4	440	8	23	51	15	7	46	15
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.60	0.60	0.60	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	43	467	33	7	733	13	33	73	21	10	66	21
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked	1.00						1.00	1.00		1.00	1.00	1.00
vC, conflicting volume	746			500			1370	1330	484	1364	1340	740
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	745			500			1370	1329	484	1364	1339	739
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			99			54	50	96	86	54	95
cM capacity (veh/h)	862			1064			72	146	583	70	144	417

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	43	500	7	746	127	97
Volume Left	43	0	7	0	33	10
Volume Right	0	33	0	13	21	21
cSH	862	1700	1064	1700	128	149
Volume to Capacity	0.05	0.29	0.01	0.44	0.99	0.65
Queue Length 95th (ft)	4	0	0	0	171	90
Control Delay (s)	9.4	0.0	8.4	0.0	143.8	65.8
Lane LOS	A		A		F	F
Approach Delay (s)	0.7		0.1		143.8	65.8
Approach LOS					F	F

Intersection Summary				
Average Delay	16.5			
Intersection Capacity Utilization	45.3%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	120	185	19	95	7	227	320	9	69	613	53
Future Volume (vph)	113	120	185	19	95	7	227	320	9	69	613	53
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1693		1770	1844		1770	3525		1770	3497	
Flt Permitted	0.68	1.00		0.20	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1264	1693		369	1844		1770	3525		1770	3497	
Peak-hour factor, PHF	0.64	0.64	0.64	0.83	0.83	0.83	0.81	0.81	0.81	0.58	0.58	0.58
Adj. Flow (vph)	177	188	289	23	114	8	280	395	11	119	1057	91
RTOR Reduction (vph)	0	70	0	0	3	0	0	2	0	0	8	0
Lane Group Flow (vph)	177	407	0	23	119	0	280	404	0	119	1140	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	20.2	20.2		20.2	20.2		14.3	38.0		8.6	32.3	
Effective Green, g (s)	20.2	20.2		20.2	20.2		14.3	38.0		8.6	32.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.18	0.47		0.11	0.40	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	317	425		92	463		315	1668		189	1406	
v/s Ratio Prot		c0.24			0.06		c0.16	0.11		0.07	c0.33	
v/s Ratio Perm	0.14			0.06								
v/c Ratio	0.56	0.96		0.25	0.26		0.89	0.24		0.63	0.81	
Uniform Delay, d1	26.2	29.6		24.0	24.0		32.2	12.6		34.3	21.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	32.7		1.4	0.3		24.7	0.3		6.4	5.2	
Delay (s)	28.3	62.4		25.4	24.3		56.9	12.9		40.7	26.5	
Level of Service	C	E		C	C		E	B		D	C	
Approach Delay (s)		53.1			24.5			30.9			27.8	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	80.3	Sum of lost time (s)	13.5
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	9	34	2	12	3	45	469	2	7	569	23
Future Volume (Veh/h)	10	9	34	2	12	3	45	469	2	7	569	23
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.56	0.56	0.56	0.75	0.75	0.75	0.71	0.71	0.71	0.86	0.86	0.86
Hourly flow rate (vph)	18	16	61	3	16	4	63	661	3	8	662	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.95	0.95		0.95	0.95	0.95				0.95		
vC, conflicting volume	1160	1482	344	1204	1494	332	689			664		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1067	1405	344	1114	1418	198	689			546		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	87	91	97	87	99	93			99		
cM capacity (veh/h)	141	121	651	119	119	772	901			970		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	95	23	63	441	223	8	441	248
Volume Left	18	3	63	0	0	8	0	0
Volume Right	61	4	0	0	3	0	0	27
cSH	269	140	901	1700	1700	970	1700	1700
Volume to Capacity	0.35	0.16	0.07	0.26	0.13	0.01	0.26	0.15
Queue Length 95th (ft)	38	14	6	0	0	1	0	0
Control Delay (s)	25.5	35.8	9.3	0.0	0.0	8.7	0.0	0.0
Lane LOS	D	E	A			A		
Approach Delay (s)	25.5	35.8	0.8			0.1		
Approach LOS	D	E						

Intersection Summary				
Average Delay	2.5			
Intersection Capacity Utilization	34.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	1	89	10	3	66
Future Volume (Veh/h)	2	1	89	10	3	66
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.72	0.72	0.82	0.82
Hourly flow rate (vph)	4	2	124	14	4	80
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	219	131			138	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	219	131			138	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	100			100	
cM capacity (veh/h)	767	919			1446	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	6	138	84
Volume Left	4	0	4
Volume Right	2	14	0
cSH	812	1700	1446
Volume to Capacity	0.01	0.08	0.00
Queue Length 95th (ft)	1	0	0
Control Delay (s)	9.5	0.0	0.4
Lane LOS	A		A
Approach Delay (s)	9.5	0.0	0.4
Approach LOS	A		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	15.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1	12	7	18	10	7	369	4	20	892	4
Future Volume (vph)	3	1	12	7	18	10	7	369	4	20	892	4
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.95		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1610		1770	1762		1770	3534		1770	3537	
Flt Permitted	0.98	1.00		0.98	1.00		0.21	1.00		0.50	1.00	
Satd. Flow (perm)	1817	1610		1817	1762		399	3534		927	3537	
Peak-hour factor, PHF	0.64	0.64	0.64	0.80	0.80	0.80	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	5	2	19	9	22	12	8	410	4	27	1189	5
RTOR Reduction (vph)	0	18	0	0	12	0	0	1	0	0	0	0
Lane Group Flow (vph)	5	3	0	9	24	0	8	413	0	27	1194	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.1	4.1		4.1	4.1		48.1	47.1		50.3	48.2	
Effective Green, g (s)	4.1	4.1		4.1	4.1		48.1	47.1		50.3	48.2	
Actuated g/C Ratio	0.06	0.06		0.06	0.06		0.72	0.71		0.75	0.72	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	111	98		111	108		307	2491		724	2552	
v/s Ratio Prot		0.00			c0.01		0.00	0.12		c0.00	c0.34	
v/s Ratio Perm	0.00			0.00			0.02			0.03		
v/c Ratio	0.05	0.03		0.08	0.22		0.03	0.17		0.04	0.47	
Uniform Delay, d1	29.5	29.5		29.6	29.8		2.8	3.3		2.1	3.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.1		0.3	1.0		0.0	0.1		0.0	0.6	
Delay (s)	29.7	29.6		29.9	30.9		2.8	3.4		2.1	4.5	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		29.6			30.7			3.4			4.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	66.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	153	20	29	74	11	18	32	10	30	72	25
Future Volume (Veh/h)	0	153	20	29	74	11	18	32	10	30	72	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.71	0.71	0.71	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	0	180	24	41	104	15	23	40	13	38	90	31
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	119			204			462	393	192	418	398	112
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	119			204			462	393	192	418	398	112
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			95	92	98	92	83	97
cM capacity (veh/h)	1469			1368			419	527	850	494	524	942

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	204	160	76	159
Volume Left	0	41	23	38
Volume Right	24	15	13	31
cSH	1469	1368	520	565
Volume to Capacity	0.00	0.03	0.15	0.28
Queue Length 95th (ft)	0	2	13	29
Control Delay (s)	0.0	2.2	13.1	13.9
Lane LOS		A	B	B
Approach Delay (s)	0.0	2.2	13.1	13.9
Approach LOS			B	B

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	98	128	45	42	12	336	267	21	85	671	30
Future Volume (vph)	53	98	128	45	42	12	336	267	21	85	671	30
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1831	1385		1816	1385	1770	3501		1770	3517	
Flt Permitted		0.74	1.00		0.55	1.00	0.13	1.00		0.52	1.00	
Satd. Flow (perm)		1387	1385		1032	1385	240	3501		972	3517	
Peak-hour factor, PHF	0.68	0.68	0.68	0.50	0.50	0.50	0.74	0.74	0.74	0.69	0.69	0.69
Adj. Flow (vph)	78	144	188	90	84	24	454	361	28	123	972	43
RTOR Reduction (vph)	0	0	149	0	0	19	0	7	0	0	4	0
Lane Group Flow (vph)	0	222	39	0	174	5	454	382	0	123	1011	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		14.7	14.7		14.7	14.7	47.5	38.3		31.3	26.6	
Effective Green, g (s)		14.7	14.7		14.7	14.7	47.5	38.3		31.3	26.6	
Actuated g/C Ratio		0.21	0.21		0.21	0.21	0.67	0.54		0.44	0.37	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		286	285		213	285	512	1883		479	1313	
v/s Ratio Prot							c0.20	0.11		0.02	0.29	
v/s Ratio Perm		0.16	0.03		c0.17	0.00	c0.39			0.10		
v/c Ratio		0.78	0.14		0.82	0.02	0.89	0.20		0.26	0.77	
Uniform Delay, d1		26.7	23.1		27.0	22.5	17.8	8.5		12.0	19.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		12.4	0.2		20.9	0.0	16.7	0.2		0.3	4.4	
Delay (s)		39.1	23.3		47.9	22.5	34.5	8.8		12.3	24.0	
Level of Service		D	C		D	C	C	A		B	C	
Approach Delay (s)		31.8			44.8			22.6			22.8	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	71.2	Sum of lost time (s)	13.5
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	393	28	4	458	8	24	53	16	7	48	16
Future Volume (Veh/h)	36	393	28	4	458	8	24	53	16	7	48	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.60	0.60	0.60	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	44	485	35	7	763	13	34	76	23	10	69	23
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked												
vC, conflicting volume	776			520			1425	1380	502	1418	1392	770
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	776			520			1425	1380	502	1418	1392	770
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			99			44	44	96	83	48	94
cM capacity (veh/h)	840			1046			61	136	569	59	134	401

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	44	520	7	776	133	102
Volume Left	44	0	7	0	34	10
Volume Right	0	35	0	13	23	23
cSH	840	1700	1046	1700	115	137
Volume to Capacity	0.05	0.31	0.01	0.46	1.16	0.74
Queue Length 95th (ft)	4	0	1	0	208	109
Control Delay (s)	9.5	0.0	8.5	0.0	205.5	83.7
Lane LOS	A		A		F	F
Approach Delay (s)	0.7		0.1		205.5	83.7
Approach LOS					F	F

Intersection Summary			
Average Delay	23.0		
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	125	193	20	99	7	236	333	9	72	638	55
Future Volume (vph)	118	125	193	20	99	7	236	333	9	72	638	55
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1693		1770	1845		1770	3525		1770	3497	
Flt Permitted	0.68	1.00		0.20	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1258	1693		378	1845		1770	3525		1770	3497	
Peak-hour factor, PHF	0.64	0.64	0.64	0.83	0.83	0.83	0.81	0.81	0.81	0.58	0.58	0.58
Adj. Flow (vph)	184	195	302	24	119	8	291	411	11	124	1100	95
RTOR Reduction (vph)	0	75	0	0	3	0	0	2	0	0	9	0
Lane Group Flow (vph)	184	422	0	24	124	0	291	420	0	124	1186	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	19.7	19.7		19.7	19.7		13.8	34.0		8.5	28.7	
Effective Green, g (s)	19.7	19.7		19.7	19.7		13.8	34.0		8.5	28.7	
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.18	0.45		0.11	0.38	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	327	440		98	480		322	1583		198	1325	
v/s Ratio Prot		c0.25			0.07		c0.16	0.12		0.07	c0.34	
v/s Ratio Perm	0.15			0.06								
v/c Ratio	0.56	0.96		0.24	0.26		0.90	0.27		0.63	0.90	
Uniform Delay, d1	24.3	27.6		22.1	22.2		30.3	13.0		32.1	22.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.2	32.3		1.3	0.3		27.1	0.4		6.1	9.6	
Delay (s)	26.5	59.9		23.4	22.5		57.4	13.4		38.1	31.7	
Level of Service	C	E		C	C		E	B		D	C	
Approach Delay (s)		50.8			22.6			31.4			32.3	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	75.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	9	35	2	12	3	47	488	2	7	592	24
Future Volume (Veh/h)	10	9	35	2	12	3	47	488	2	7	592	24
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.56	0.56	0.56	0.75	0.75	0.75	0.71	0.71	0.71	0.86	0.86	0.86
Hourly flow rate (vph)	18	16	63	3	16	4	66	687	3	8	688	28
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.95	0.95		0.95	0.95	0.95				0.95		
vC, conflicting volume	1206	1540	358	1252	1552	345	716			690		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1104	1457	358	1153	1471	195	716			559		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	86	86	90	97	85	99	93			99		
cM capacity (veh/h)	130	112	638	109	109	770	880			954		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	97	23	66	458	232	8	459	257
Volume Left	18	3	66	0	0	8	0	0
Volume Right	63	4	0	0	3	0	0	28
cSH	255	129	880	1700	1700	954	1700	1700
Volume to Capacity	0.38	0.18	0.07	0.27	0.14	0.01	0.27	0.15
Queue Length 95th (ft)	42	16	6	0	0	1	0	0
Control Delay (s)	27.6	39.0	9.4	0.0	0.0	8.8	0.0	0.0
Lane LOS	D	E	A			A		
Approach Delay (s)	27.6	39.0	0.8			0.1		
Approach LOS	D	E						

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	35.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
1: Park Ave & S 3rd St

11/13/2018

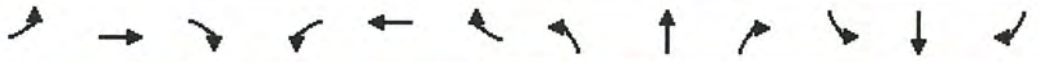
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	14	89	10	14	66
Future Volume (Veh/h)	2	14	89	10	14	66
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.72	0.72	0.82	0.82
Hourly flow rate (vph)	4	28	124	14	17	80
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	245	131			138	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	245	131			138	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	97			99	
cM capacity (veh/h)	735	919			1446	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	138	97
Volume Left	4	0	17
Volume Right	28	14	0
cSH	891	1700	1446
Volume to Capacity	0.04	0.08	0.01
Queue Length 95th (ft)	3	0	1
Control Delay (s)	9.2	0.0	1.4
Lane LOS	A		A
Approach Delay (s)	9.2	0.0	1.4
Approach LOS	A		

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	20.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

11/13/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1	23	7	18	10	20	366	4	20	890	4
Future Volume (vph)	3	1	23	7	18	10	20	366	4	20	890	4
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.95		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1598		1770	1762		1770	3534		1770	3537	
Flt Permitted	0.98	1.00		0.98	1.00		0.21	1.00		0.50	1.00	
Satd. Flow (perm)	1817	1598		1817	1762		399	3534		930	3537	
Peak-hour factor, PHF	0.64	0.64	0.64	0.80	0.80	0.80	0.90	0.90	0.90	0.75	0.75	0.75
Adj. Flow (vph)	5	2	36	9	22	12	22	407	4	27	1187	5
RTOR Reduction (vph)	0	34	0	0	12	0	0	1	0	0	0	0
Lane Group Flow (vph)	5	4	0	9	24	0	22	410	0	27	1192	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.1	4.1		4.1	4.1		47.1	46.1		49.3	47.2	
Effective Green, g (s)	4.1	4.1		4.1	4.1		47.1	46.1		49.3	47.2	
Actuated g/C Ratio	0.06	0.06		0.06	0.06		0.72	0.70		0.75	0.72	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	113	99		113	109		306	2475		723	2537	
v/s Ratio Prot		0.00			c0.01		0.00	0.12		c0.00	c0.34	
v/s Ratio Perm	0.00			0.00			0.05			0.03		
v/c Ratio	0.04	0.04		0.08	0.22		0.07	0.17		0.04	0.47	
Uniform Delay, d1	29.0	29.0		29.1	29.3		2.8	3.3		2.1	4.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.3	1.0		0.1	0.1		0.0	0.6	
Delay (s)	29.2	29.2		29.4	30.3		2.9	3.5		2.1	4.6	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		29.2			30.1			3.5			4.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	5.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	65.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	0	153	20	101	74	11	18	60	71	30	105	23
Future Volume (Veh/h)	0	153	20	101	74	11	18	60	71	30	105	23
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.71	0.71	0.71	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	0	180	24	142	104	15	23	75	89	38	131	29
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	119			204			682	595	192	714	600	112
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	119			204			682	595	192	714	600	112
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			90			90	80	90	84	65	97
cM capacity (veh/h)	1469			1368			237	374	850	242	372	942

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	204	261	187	198
Volume Left	0	142	23	38
Volume Right	24	15	89	29
cSH	1469	1368	465	367
Volume to Capacity	0.00	0.10	0.40	0.54
Queue Length 95th (ft)	0	9	48	77
Control Delay (s)	0.0	4.7	17.9	25.8
Lane LOS		A	C	D
Approach Delay (s)	0.0	4.7	17.9	25.8
Approach LOS			C	D

Intersection Summary			
Average Delay	11.4		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	92	120	128	45	68	12	336	264	21	85	669	76
Future Volume (vph)	92	120	128	45	68	12	336	264	21	85	669	76
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected		0.98	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1823	1385		1826	1385	1770	3501		1770	3485	
Flt Permitted		0.61	1.00		0.48	1.00	0.13	1.00		0.52	1.00	
Satd. Flow (perm)		1130	1385		886	1385	245	3501		976	3485	
Peak-hour factor, PHF	0.68	0.68	0.68	0.50	0.50	0.50	0.74	0.74	0.74	0.69	0.69	0.69
Adj. Flow (vph)	135	176	188	90	136	24	454	357	28	123	970	110
RTOR Reduction (vph)	0	0	142	0	0	18	0	7	0	0	11	0
Lane Group Flow (vph)	0	311	46	0	226	6	454	378	0	123	1069	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		18.3	18.3		18.3	18.3	47.5	38.2		30.7	25.9	
Effective Green, g (s)		18.3	18.3		18.3	18.3	47.5	38.2		30.7	25.9	
Actuated g/C Ratio		0.24	0.24		0.24	0.24	0.64	0.51		0.41	0.35	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		276	338		216	338	504	1787		451	1206	
v/s Ratio Prot							c0.21	0.11		0.02	0.31	
v/s Ratio Perm		c0.28	0.03		0.26	0.00	c0.37			0.09		
v/c Ratio		1.13	0.14		1.05	0.02	0.90	0.21		0.27	0.89	
Uniform Delay, d1		28.2	22.1		28.2	21.4	19.3	10.0		14.0	23.1	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		92.7	0.2		73.9	0.0	19.1	0.3		0.3	9.8	
Delay (s)		121.0	22.3		102.2	21.5	38.4	10.3		14.3	32.8	
Level of Service		F	C		F	C	D	B		B	C	
Approach Delay (s)		83.8			94.4			25.5			30.9	
Approach LOS		F			F			C			C	

Intersection Summary			
HCM 2000 Control Delay	44.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	74.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	393	61	4	458	8	52	50	16	7	46	11
Future Volume (Veh/h)	29	393	61	4	458	8	52	50	16	7	46	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.81	0.81	0.81	0.60	0.60	0.60	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	36	485	75	7	763	13	74	71	23	10	66	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked												
vC, conflicting volume	776			560			1420	1384	522	1399	1416	770
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	776			560			1420	1384	522	1399	1416	770
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			99			0	48	96	84	49	96
cM capacity (veh/h)	840			1011			64	136	554	64	131	401

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	36	560	7	776	168	92
Volume Left	36	0	7	0	74	10
Volume Right	0	75	0	13	23	16
cSH	840	1700	1011	1700	97	131
Volume to Capacity	0.04	0.33	0.01	0.46	1.73	0.70
Queue Length 95th (ft)	3	0	1	0	337	98
Control Delay (s)	9.5	0.0	8.6	0.0	440.4	79.9
Lane LOS	A		A		F	F
Approach Delay (s)	0.6		0.1		440.4	79.9
Approach LOS					F	F

Intersection Summary			
Average Delay	49.9		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	118	125	193	20	99	7	236	369	9	72	682	55
Future Volume (vph)	118	125	193	20	99	7	236	369	9	72	682	55
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.99		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1693		1770	1845		1770	3527		1770	3500	
Flt Permitted	0.68	1.00		0.20	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1258	1693		378	1845		1770	3527		1770	3500	
Peak-hour factor, PHF	0.64	0.64	0.64	0.83	0.83	0.83	0.81	0.81	0.81	0.58	0.58	0.58
Adj. Flow (vph)	184	195	302	24	119	8	291	456	11	124	1176	95
RTOR Reduction (vph)	0	75	0	0	3	0	0	2	0	0	8	0
Lane Group Flow (vph)	184	422	0	24	124	0	291	465	0	124	1263	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	19.7	19.7		19.7	19.7		13.8	34.0		8.5	28.7	
Effective Green, g (s)	19.7	19.7		19.7	19.7		13.8	34.0		8.5	28.7	
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.18	0.45		0.11	0.38	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	327	440		98	480		322	1584		198	1326	
v/s Ratio Prot		c0.25			0.07		c0.16	0.13		0.07	c0.36	
v/s Ratio Perm	0.15			0.06								
v/c Ratio	0.56	0.96		0.24	0.26		0.90	0.29		0.63	0.95	
Uniform Delay, d1	24.3	27.6		22.1	22.2		30.3	13.2		32.1	22.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.2	32.3		1.3	0.3		27.1	0.5		6.1	15.7	
Delay (s)	26.5	59.9		23.4	22.5		57.4	13.7		38.1	38.5	
Level of Service	C	E		C	C		E	B		D	D	
Approach Delay (s)		50.8			22.6			30.5			38.5	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	38.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	75.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

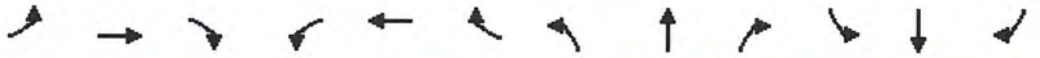
HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	5	33	2	7	3	44	520	2	7	630	15
Future Volume (Veh/h)	3	5	33	2	7	3	44	520	2	7	630	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.56	0.56	0.56	0.75	0.75	0.75	0.71	0.71	0.71	0.86	0.86	0.86
Hourly flow rate (vph)	5	9	59	3	9	4	62	732	3	8	733	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	1256	1616	375	1304	1624	368	750			735		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1134	1520	375	1185	1527	183	750			576		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	91	91	97	91	99	93			99		
cM capacity (veh/h)	128	101	623	107	100	774	855			928		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	73	16	62	488	247	8	489	261
Volume Left	5	3	62	0	0	8	0	0
Volume Right	59	4	0	0	3	0	0	17
cSH	328	130	855	1700	1700	928	1700	1700
Volume to Capacity	0.22	0.12	0.07	0.29	0.15	0.01	0.29	0.15
Queue Length 95th (ft)	21	10	6	0	0	1	0	0
Control Delay (s)	19.1	36.6	9.5	0.0	0.0	8.9	0.0	0.0
Lane LOS	C	E	A			A		
Approach Delay (s)	19.1	36.6	0.7			0.1		
Approach LOS	C	E						

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	34.6%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	29	393	61	4	458	8	52	50	16	7	46	11
Future Volume (vph)	29	393	61	4	458	8	52	50	16	7	46	11
Peak Hour Factor	0.81	0.81	0.81	0.60	0.60	0.60	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	36	485	75	7	763	13	74	71	23	10	66	16

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	36	560	7	776	168	92
Volume Left (vph)	36	0	7	0	74	10
Volume Right (vph)	0	75	0	13	23	16
Hadj (s)	0.53	-0.06	0.53	0.02	0.04	-0.05
Departure Headway (s)	6.9	6.3	7.0	6.5	7.4	7.7
Degree Utilization, x	0.07	0.98	0.01	1.40	0.35	0.20
Capacity (veh/h)	508	560	507	558	471	443
Control Delay (s)	9.2	56.4	8.9	207.6	14.2	12.5
Approach Delay (s)	53.6		205.8		14.2	12.5
Approach LOS	F		F		B	B

Intersection Summary				
Delay	120.0			
Level of Service	F			
Intersection Capacity Utilization	44.4%	ICU Level of Service		A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

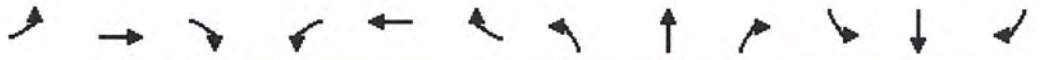
11/14/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	393	61	4	458	8	52	50	16	7	46	11
Future Volume (vph)	29	393	61	4	458	8	52	50	16	7	46	11
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	1.00			0.98			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1770	1825		1770	1858			1565			1583	
Flt Permitted	0.21	1.00		0.37	1.00			0.82			0.96	
Satd. Flow (perm)	388	1825		689	1858			1313			1527	
Peak-hour factor, PHF	0.81	0.81	0.81	0.60	0.60	0.60	0.70	0.70	0.70	0.70	0.70	0.70
Adj. Flow (vph)	36	485	75	7	763	13	74	71	23	10	66	16
RTOR Reduction (vph)	0	9	0	0	1	0	0	11	0	0	12	0
Lane Group Flow (vph)	36	551	0	7	775	0	0	157	0	0	80	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.1	24.1		24.1	24.1			10.9			10.9	
Effective Green, g (s)	24.1	24.1		24.1	24.1			10.9			10.9	
Actuated g/C Ratio	0.55	0.55		0.55	0.55			0.25			0.25	
Clearance Time (s)	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	
Lane Grp Cap (vph)	212	999		377	1017			325			378	
v/s Ratio Prot		0.30			c0.42							
v/s Ratio Perm	0.09			0.01				c0.12			0.05	
v/c Ratio	0.17	0.55		0.02	0.76			0.48			0.21	
Uniform Delay, d1	5.0	6.4		4.5	7.7			14.1			13.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.4	0.7		0.0	3.4			1.1			0.3	
Delay (s)	5.3	7.1		4.6	11.2			15.3			13.4	
Level of Service	A	A		A	B			B			B	
Approach Delay (s)		7.0			11.1			15.3			13.4	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	44.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

11/14/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	5	33	2	7	3	44	520	2	7	630	15
Future Volume (vph)	3	5	33	2	7	3	44	520	2	7	630	15
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	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.89			0.97		1.00	1.00		1.00	1.00	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1654			1783		1770	3537		1770	3527	
Flt Permitted		0.97			0.92		0.37	1.00		0.37	1.00	
Satd. Flow (perm)		1615			1649		684	3537		694	3527	
Peak-hour factor, PHF	0.56	0.56	0.56	0.75	0.75	0.75	0.71	0.71	0.71	0.86	0.86	0.86
Adj. Flow (vph)	5	9	59	3	9	4	62	732	3	8	733	17
RTOR Reduction (vph)	0	53	0	0	4	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	20	0	0	12	0	62	735	0	8	748	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		3.6			3.6		23.9	23.9		23.9	23.9	
Effective Green, g (s)		3.6			3.6		23.9	23.9		23.9	23.9	
Actuated g/C Ratio		0.10			0.10		0.65	0.65		0.65	0.65	
Clearance Time (s)		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	
Lane Grp Cap (vph)		159			162		447	2316		454	2309	
v/s Ratio Prot								0.21			c0.21	
v/s Ratio Perm		c0.01			0.01		0.09			0.01		
v/c Ratio		0.12			0.08		0.14	0.32		0.02	0.32	
Uniform Delay, d1		15.0			14.9		2.4	2.7		2.2	2.8	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.2		0.1	0.1		0.0	0.1	
Delay (s)		15.4			15.1		2.5	2.8		2.2	2.8	
Level of Service		B			B		A	A		A	A	
Approach Delay (s)		15.4			15.1			2.8			2.8	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	3.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	36.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	16	15	137	14	9	90
Future Volume (Veh/h)	16	15	137	14	9	90
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.72	0.72	0.63	0.63
Hourly flow rate (vph)	32	30	190	19	14	143
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	370	200			209	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	370	200			209	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	96			99	
cM capacity (veh/h)	623	841			1362	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	62	209	157
Volume Left	32	0	14
Volume Right	30	19	0
cSH	713	1700	1362
Volume to Capacity	0.09	0.12	0.01
Queue Length 95th (ft)	7	0	1
Control Delay (s)	10.5	0.0	0.8
Lane LOS	B		A
Approach Delay (s)	10.5	0.0	0.8
Approach LOS	B		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	9	18	21	7	73	15	636	15	39	561	13
Future Volume (vph)	15	9	18	21	7	73	15	636	15	39	561	13
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.90		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1676		1770	1608		1770	3527		1770	3528	
Flt Permitted	0.69	1.00		0.73	1.00		0.41	1.00		0.35	1.00	
Satd. Flow (perm)	1290	1676		1363	1608		764	3527		648	3528	
Peak-hour factor, PHF	0.70	0.70	0.70	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	21	13	26	26	9	91	17	707	17	43	623	14
RTOR Reduction (vph)	0	24	0	0	84	0	0	1	0	0	1	0
Lane Group Flow (vph)	21	15	0	26	16	0	17	723	0	43	636	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.8	5.8		5.8	5.8		52.7	51.6		57.7	54.1	
Effective Green, g (s)	5.8	5.8		5.8	5.8		52.7	51.6		57.7	54.1	
Actuated g/C Ratio	0.08	0.08		0.08	0.08		0.71	0.69		0.77	0.73	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	100	130		106	125		555	2442		556	2561	
v/s Ratio Prot		0.01			0.01		0.00	c0.20		c0.00	0.18	
v/s Ratio Perm	0.02			c0.02			0.02			0.06		
v/c Ratio	0.21	0.12		0.25	0.13		0.03	0.30		0.08	0.25	
Uniform Delay, d1	32.2	32.0		32.3	32.0		3.2	4.4		2.1	3.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.4		1.2	0.5		0.0	0.3		0.1	0.2	
Delay (s)	33.3	32.4		33.5	32.5		3.2	4.7		2.1	3.6	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		32.7			32.7			4.7			3.5	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	74.5	Sum of lost time (s)	13.5
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	14	147	16	23	143	8	37	26	33	10	83	7
Future Volume (Veh/h)	14	147	16	23	143	8	37	26	33	10	83	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.81	0.81	0.81	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	20	213	23	28	177	10	44	31	39	12	99	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	187			236			560	508	224	557	514	182
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	187			236			560	508	224	557	514	182
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			87	93	95	97	78	99
cM capacity (veh/h)	1387			1331			352	452	815	387	448	861

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	256	215	114	119
Volume Left	20	28	44	12
Volume Right	23	10	39	8
cSH	1387	1331	472	455
Volume to Capacity	0.01	0.02	0.24	0.26
Queue Length 95th (ft)	1	2	23	26
Control Delay (s)	0.7	1.2	15.0	15.7
Lane LOS	A	A	C	C
Approach Delay (s)	0.7	1.2	15.0	15.7
Approach LOS			C	C

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	33.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	53	94	66	52	14	259	635	85	100	419	35
Future Volume (vph)	42	53	94	66	52	14	259	635	85	100	419	35
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1823	1385		1812	1385	1770	3477		1770	3499	
Flt Permitted		0.71	1.00		0.74	1.00	0.38	1.00		0.34	1.00	
Satd. Flow (perm)		1320	1385		1382	1385	710	3477		633	3499	
Peak-hour factor, PHF	0.71	0.71	0.71	0.58	0.58	0.58	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	59	75	132	114	90	24	288	706	94	112	471	39
RTOR Reduction (vph)	0	0	104	0	0	19	0	9	0	0	5	0
Lane Group Flow (vph)	0	134	28	0	204	5	288	791	0	112	505	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		15.8	15.8		15.8	15.8	49.9	39.9		40.2	34.7	
Effective Green, g (s)		15.8	15.8		15.8	15.8	49.9	39.9		40.2	34.7	
Actuated g/C Ratio		0.21	0.21		0.21	0.21	0.67	0.53		0.54	0.46	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		279	292		292	292	626	1857		424	1625	
v/s Ratio Prot							c0.07	0.23		0.02	0.14	
v/s Ratio Perm		0.10	0.02		c0.15	0.00	c0.24			0.12		
v/c Ratio		0.48	0.10		0.70	0.02	0.46	0.43		0.26	0.31	
Uniform Delay, d1		25.8	23.7		27.2	23.3	5.4	10.5		8.5	12.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.3	0.1		7.1	0.0	0.5	0.7		0.3	0.5	
Delay (s)		27.2	23.8		34.4	23.3	5.9	11.2		8.8	13.0	
Level of Service		C	C		C	C	A	B		A	B	
Approach Delay (s)		25.5			33.2			9.8			12.3	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	74.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	848	32	1	304	2	23	9	23	4	45	33
Future Volume (Veh/h)	5	848	32	1	304	2	23	9	23	4	45	33
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	6	942	36	1	338	2	26	10	26	4	50	37
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked												
vC, conflicting volume	340			978			1374	1314	960	1326	1331	339
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	340			978			1374	1314	960	1326	1331	339
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			70	94	92	97	67	95
cM capacity (veh/h)	1219			706			87	157	311	115	153	703

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	6	978	1	340	62	91
Volume Left	6	0	1	0	26	4
Volume Right	0	36	0	2	26	37
cSH	1219	1700	706	1700	139	220
Volume to Capacity	0.00	0.58	0.00	0.20	0.45	0.41
Queue Length 95th (ft)	0	0	0	0	50	47
Control Delay (s)	8.0	0.0	10.1	0.0	50.5	32.4
Lane LOS	A		B		F	D
Approach Delay (s)	0.0		0.0		50.5	32.4
Approach LOS					F	D

Intersection Summary				
Average Delay	4.2			
Intersection Capacity Utilization	63.1%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	83	260	230	36	178	7	288	418	15	1	293	100
Future Volume (vph)	83	260	230	36	178	7	288	418	15	1	293	100
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.93		1.00	0.99		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1732		1770	1853		1770	3520		1770	3404	
Flt Permitted	0.56	1.00		0.11	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1050	1732		199	1853		1770	3520		1770	3404	
Peak-hour factor, PHF	0.64	0.64	0.64	0.83	0.83	0.83	0.81	0.81	0.81	0.58	0.58	0.58
Adj. Flow (vph)	130	406	359	43	214	8	356	516	19	2	505	172
RTOR Reduction (vph)	0	37	0	0	2	0	0	3	0	0	36	0
Lane Group Flow (vph)	130	728	0	43	220	0	356	532	0	2	641	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	37.5	37.5		37.5	37.5		19.3	41.6		1.0	23.3	
Effective Green, g (s)	37.5	37.5		37.5	37.5		19.3	41.6		1.0	23.3	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.21	0.44		0.01	0.25	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	420	693		79	742		364	1564		18	847	
v/s Ratio Prot		c0.42			0.12		c0.20	0.15		0.00	c0.19	
v/s Ratio Perm	0.12			0.22								
v/c Ratio	0.31	1.05		0.54	0.30		0.98	0.34		0.11	0.76	
Uniform Delay, d1	19.2	28.0		21.5	19.1		36.9	17.0		45.9	32.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	48.4		7.5	0.2		40.8	0.6		2.7	6.3	
Delay (s)	19.6	76.4		29.0	19.3		77.8	17.6		48.6	38.8	
Level of Service	B	E		C	B		E	B		D	D	
Approach Delay (s)		68.2			20.9			41.7			38.8	
Approach LOS		E			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	47.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	93.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	20	45	0	7	5	10	638	3	0	437	14
Future Volume (Veh/h)	14	20	45	0	7	5	10	638	3	0	437	14
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.56	0.56	0.56	0.75	0.75	0.75	0.71	0.71	0.71	0.86	0.86	0.86
Hourly flow rate (vph)	25	36	80	0	9	7	14	899	4	0	508	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.91	0.91		0.91	0.91	0.91				0.91		
vC, conflicting volume	1005	1447	262	1281	1453	452	524			903		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	805	1291	262	1109	1298	196	524			693		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	75	89	100	94	99	99			100		
cM capacity (veh/h)	232	145	737	107	144	738	1039			816		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	141	16	14	599	304	0	339	185
Volume Left	25	0	14	0	0	0	0	0
Volume Right	80	7	0	0	4	0	0	16
cSH	304	222	1039	1700	1700	1700	1700	1700
Volume to Capacity	0.46	0.07	0.01	0.35	0.18	0.00	0.20	0.11
Queue Length 95th (ft)	58	6	1	0	0	0	0	0
Control Delay (s)	26.7	22.5	8.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C	A					
Approach Delay (s)	26.7	22.5	0.1			0.0		
Approach LOS	D	C						

Intersection Summary				
Average Delay	2.7			
Intersection Capacity Utilization	35.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	16	143	15	9	94
Future Volume (Veh/h)	17	16	143	15	9	94
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.72	0.72	0.63	0.63
Hourly flow rate (vph)	34	32	199	21	14	149
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	386	210			220	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	386	210			220	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	96			99	
cM capacity (veh/h)	610	831			1349	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	220	163
Volume Left	34	0	14
Volume Right	32	21	0
cSH	700	1700	1349
Volume to Capacity	0.09	0.13	0.01
Queue Length 95th (ft)	8	0	1
Control Delay (s)	10.7	0.0	0.7
Lane LOS	B		A
Approach Delay (s)	10.7	0.0	0.7
Approach LOS	B		

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	22.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	9	19	22	7	76	16	662	16	41	584	14
Future Volume (vph)	16	9	19	22	7	76	16	662	16	41	584	14
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.90		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1674		1770	1608		1770	3527		1770	3526	
Flt Permitted	0.69	1.00		0.73	1.00		0.40	1.00		0.33	1.00	
Satd. Flow (perm)	1285	1674		1362	1608		743	3527		624	3526	
Peak-hour factor, PHF	0.70	0.70	0.70	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	13	27	28	9	95	18	736	18	46	649	16
RTOR Reduction (vph)	0	25	0	0	87	0	0	1	0	0	1	0
Lane Group Flow (vph)	23	15	0	28	17	0	18	753	0	46	664	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	5.9	5.9		5.9	5.9		52.4	51.3		57.4	53.8	
Effective Green, g (s)	5.9	5.9		5.9	5.9		52.4	51.3		57.4	53.8	
Actuated g/C Ratio	0.08	0.08		0.08	0.08		0.71	0.69		0.77	0.72	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	102	132		108	127		539	2435		537	2553	
v/s Ratio Prot		0.01			0.01		0.00	c0.21		c0.00	0.19	
v/s Ratio Perm	0.02			c0.02			0.02			0.06		
v/c Ratio	0.23	0.11		0.26	0.13		0.03	0.31		0.09	0.26	
Uniform Delay, d1	32.1	31.8		32.1	31.8		3.3	4.5		2.1	3.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.4		1.3	0.5		0.0	0.3		0.1	0.2	
Delay (s)	33.2	32.2		33.4	32.3		3.3	4.9		2.2	3.7	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		32.5			32.5			4.8			3.6	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	74.3	Sum of lost time (s)	13.5
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
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)	15	153	17	24	149	8	39	27	34	10	86	7
Future Volume (Veh/h)	15	153	17	24	149	8	39	27	34	10	86	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.81	0.81	0.81	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	22	222	25	30	184	10	46	32	40	12	102	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	194			247			586	532	234	584	540	189
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	194			247			586	532	234	584	540	189
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			98			86	93	95	97	76	99
cM capacity (veh/h)	1379			1319			332	436	805	369	431	853

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	269	224	118	122
Volume Left	22	30	46	12
Volume Right	25	10	40	8
cSH	1379	1319	451	438
Volume to Capacity	0.02	0.02	0.26	0.28
Queue Length 95th (ft)	1	2	26	28
Control Delay (s)	0.8	1.2	15.8	16.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.8	1.2	15.8	16.4
Approach LOS			C	C

Intersection Summary				
Average Delay	5.9			
Intersection Capacity Utilization	33.8%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	55	98	69	54	15	270	661	88	104	436	36
Future Volume (vph)	44	55	98	69	54	15	270	661	88	104	436	36
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1822	1385		1812	1385	1770	3477		1770	3499	
Flt Permitted		0.69	1.00		0.73	1.00	0.37	1.00		0.32	1.00	
Satd. Flow (perm)		1285	1385		1360	1385	684	3477		605	3499	
Peak-hour factor, PHF	0.71	0.71	0.71	0.58	0.58	0.58	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	62	77	138	119	93	26	300	734	98	117	490	40
RTOR Reduction (vph)	0	0	108	0	0	20	0	9	0	0	5	0
Lane Group Flow (vph)	0	139	30	0	212	6	300	823	0	117	525	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		16.4	16.4		16.4	16.4	50.0	39.9		40.0	34.4	
Effective Green, g (s)		16.4	16.4		16.4	16.4	50.0	39.9		40.0	34.4	
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.66	0.53		0.53	0.46	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		279	301		295	301	613	1839		407	1596	
v/s Ratio Prot							c0.07	0.24		0.02	0.15	
v/s Ratio Perm		0.11	0.02		c0.16	0.00	c0.25			0.13		
v/c Ratio		0.50	0.10		0.72	0.02	0.49	0.45		0.29	0.33	
Uniform Delay, d1		25.9	23.6		27.4	23.2	5.7	10.9		8.9	13.1	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.4	0.1		8.1	0.0	0.6	0.8		0.4	0.6	
Delay (s)		27.3	23.7		35.5	23.2	6.3	11.7		9.3	13.7	
Level of Service		C	C		D	C	A	B		A	B	
Approach Delay (s)		25.5			34.1			10.3			12.9	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	75.4	Sum of lost time (s)	13.5
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	882	33	1	316	2	24	9	24	4	47	34
Future Volume (Veh/h)	5	882	33	1	316	2	24	9	24	4	47	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	6	980	37	1	351	2	27	10	27	4	52	38
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked												
vC, conflicting volume	353			1017			1428	1366	998	1378	1383	352
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	353			1017			1428	1366	998	1378	1383	352
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			64	93	91	96	64	95
cM capacity (veh/h)	1206			682			76	146	296	105	143	692

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	6	1017	1	353	64	94
Volume Left	6	0	1	0	27	4
Volume Right	0	37	0	2	27	38
cSH	1206	1700	682	1700	124	205
Volume to Capacity	0.00	0.60	0.00	0.21	0.51	0.46
Queue Length 95th (ft)	0	0	0	0	60	55
Control Delay (s)	8.0	0.0	10.3	0.0	61.3	36.5
Lane LOS	A		B		F	E
Approach Delay (s)	0.0		0.0		61.3	36.5
Approach LOS					F	E

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

11/13/2018

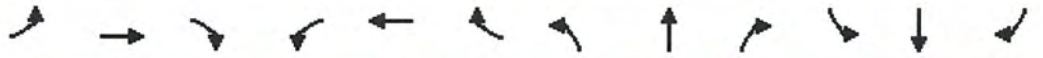
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	271	239	37	185	7	300	435	16	0	305	104
Future Volume (vph)	86	271	239	37	185	7	300	435	16	0	305	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost 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		1.00	0.95			0.95	
Frt	1.00	0.93		1.00	0.99		1.00	0.99			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1770	1732		1770	1853		1770	3520			3404	
Flt Permitted	0.56	1.00		0.11	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1046	1732		199	1853		1770	3520			3404	
Peak-hour factor, PHF	0.64	0.64	0.64	0.83	0.83	0.83	0.81	0.81	0.81	0.58	0.58	0.58
Adj. Flow (vph)	134	423	373	45	223	8	370	537	20	0	526	179
RTOR Reduction (vph)	0	35	0	0	1	0	0	3	0	0	37	0
Lane Group Flow (vph)	134	761	0	45	230	0	370	554	0	0	668	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	37.5	37.5		37.5	37.5		19.3	43.5			19.7	
Effective Green, g (s)	37.5	37.5		37.5	37.5		19.3	43.5			19.7	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.21	0.48			0.22	
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)	435	721		82	772		379	1701			745	
v/s Ratio Prot		c0.44			0.12		c0.21	0.16			c0.20	
v/s Ratio Perm	0.13			0.23								
v/c Ratio	0.31	1.06		0.55	0.30		0.98	0.33			0.90	
Uniform Delay, d1	17.6	26.2		19.9	17.5		35.1	14.3			34.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	49.1		7.3	0.2		39.5	0.5			15.6	
Delay (s)	18.0	75.4		27.2	17.7		74.7	14.8			49.8	
Level of Service	B	E		C	B		E	B			D	
Approach Delay (s)		67.1			19.2			38.7			49.8	
Approach LOS		E			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	48.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

11/13/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	21	47	0	7	5	10	664	3	0	455	15
Future Volume (Veh/h)	15	21	47	0	7	5	10	664	3	0	455	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.56	0.56	0.56	0.75	0.75	0.75	0.71	0.71	0.71	0.86	0.86	0.86
Hourly flow rate (vph)	27	38	84	0	9	7	14	935	4	0	529	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.91	0.91		0.91	0.91	0.91				0.91		
vC, conflicting volume	1044	1504	273	1332	1511	470	546			939		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	855	1360	273	1171	1367	224	546			739		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	71	88	100	93	99	99			100		
cM capacity (veh/h)	213	132	725	92	131	710	1019			787		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	149	16	14	623	316	0	353	193
Volume Left	27	0	14	0	0	0	0	0
Volume Right	84	7	0	0	4	0	0	17
cSH	281	204	1019	1700	1700	1700	1700	1700
Volume to Capacity	0.53	0.08	0.01	0.37	0.19	0.00	0.21	0.11
Queue Length 95th (ft)	72	6	1	0	0	0	0	0
Control Delay (s)	31.3	24.2	8.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C	A					
Approach Delay (s)	31.3	24.2	0.1			0.0		
Approach LOS	D	C						

Intersection Summary				
Average Delay	3.1			
Intersection Capacity Utilization	36.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	22	143	15	16	94
Future Volume (Veh/h)	17	22	143	15	16	94
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.72	0.72	0.63	0.63
Hourly flow rate (vph)	34	44	199	21	25	149
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	408	210			220	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	408	210			220	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	95			98	
cM capacity (veh/h)	588	831			1349	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	78	220	174
Volume Left	34	0	25
Volume Right	44	21	0
cSH	704	1700	1349
Volume to Capacity	0.11	0.13	0.02
Queue Length 95th (ft)	9	0	1
Control Delay (s)	10.7	0.0	1.2
Lane LOS	B		A
Approach Delay (s)	10.7	0.0	1.2
Approach LOS	B		

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	27.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

11/13/2018

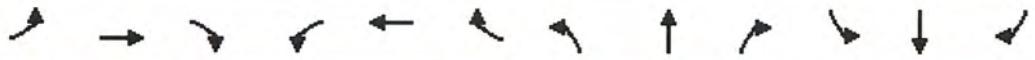
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	9	26	22	7	76	22	661	16	41	583	14
Future Volume (vph)	16	9	26	22	7	76	22	661	16	41	583	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.86		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1656		1770	1608		1770	3527		1770	3526	
Flt Permitted	0.69	1.00		0.72	1.00		0.40	1.00		0.34	1.00	
Satd. Flow (perm)	1285	1656		1349	1608		744	3527		639	3526	
Peak-hour factor, PHF	0.70	0.70	0.70	0.80	0.80	0.80	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	23	13	37	28	9	95	24	734	18	46	648	16
RTOR Reduction (vph)	0	34	0	0	87	0	0	1	0	0	1	0
Lane Group Flow (vph)	23	16	0	28	17	0	24	751	0	46	663	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	6.0	6.0		6.0	6.0		52.7	50.4		55.3	51.7	
Effective Green, g (s)	6.0	6.0		6.0	6.0		52.7	50.4		55.3	51.7	
Actuated g/C Ratio	0.08	0.08		0.08	0.08		0.72	0.69		0.75	0.70	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	104	135		110	131		565	2418		536	2480	
v/s Ratio Prot		0.01			0.01		0.00	c0.21		c0.00	0.19	
v/s Ratio Perm	0.02			c0.02			0.03			0.06		
v/c Ratio	0.22	0.12		0.25	0.13		0.04	0.31		0.09	0.27	
Uniform Delay, d1	31.6	31.3		31.7	31.3		3.0	4.6		2.4	4.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.4		1.2	0.4		0.0	0.3		0.1	0.3	
Delay (s)	32.6	31.7		32.9	31.8		3.0	4.9		2.5	4.2	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		32.0			32.0			4.9			4.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	73.5	Sum of lost time (s)	13.5
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

11/13/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	14	153	17	54	149	8	39	44	70	10	100	6
Future Volume (Veh/h)	14	153	17	54	149	8	39	44	70	10	100	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.81	0.81	0.81	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	20	222	25	67	184	10	46	52	83	12	119	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	194			247			664	602	234	706	610	189
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	194			247			664	602	234	706	610	189
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			95			83	87	90	96	69	99
cM capacity (veh/h)	1379			1319			269	387	805	268	383	853

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	267	261	181	138
Volume Left	20	67	46	12
Volume Right	25	10	83	7
cSH	1379	1319	443	379
Volume to Capacity	0.01	0.05	0.41	0.36
Queue Length 95th (ft)	1	4	49	41
Control Delay (s)	0.7	2.4	18.6	19.8
Lane LOS	A	A	C	C
Approach Delay (s)	0.7	2.4	18.6	19.8
Approach LOS			C	C

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

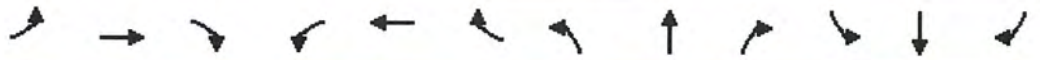
11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	68	98	69	65	15	270	660	88	104	435	55
Future Volume (vph)	67	68	98	69	65	15	270	660	88	104	435	55
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.98	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1818	1385		1816	1385	1770	3477		1770	3479	
Flt Permitted		0.59	1.00		0.64	1.00	0.35	1.00		0.32	1.00	
Satd. Flow (perm)		1090	1385		1197	1385	648	3477		603	3479	
Peak-hour factor, PHF	0.71	0.71	0.71	0.58	0.58	0.58	0.90	0.90	0.90	0.89	0.89	0.89
Adj. Flow (vph)	94	96	138	119	112	26	300	733	98	117	489	62
RTOR Reduction (vph)	0	0	105	0	0	20	0	10	0	0	8	0
Lane Group Flow (vph)	0	190	33	0	231	6	300	821	0	117	543	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		18.7	18.7		18.7	18.7	50.1	40.0		39.5	33.9	
Effective Green, g (s)		18.7	18.7		18.7	18.7	50.1	40.0		39.5	33.9	
Actuated g/C Ratio		0.24	0.24		0.24	0.24	0.64	0.51		0.51	0.44	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		261	332		287	332	586	1787		390	1515	
v/s Ratio Prot							c0.08	0.24		0.02	0.16	
v/s Ratio Perm		0.17	0.02		c0.19	0.00	c0.25			0.13		
v/c Ratio		0.73	0.10		0.80	0.02	0.51	0.46		0.30	0.36	
Uniform Delay, d1		27.2	23.0		27.8	22.5	6.7	12.0		10.1	14.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		9.7	0.1		15.0	0.0	0.8	0.9		0.4	0.7	
Delay (s)		36.9	23.1		42.9	22.6	7.4	12.9		10.5	15.3	
Level of Service		D	C		D	C	A	B		B	B	
Approach Delay (s)		31.1			40.8			11.4			14.5	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

11/13/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	882	47	1	316	2	41	8	24	4	46	31
Future Volume (Veh/h)	2	882	47	1	316	2	41	8	24	4	46	31
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	2	980	52	1	351	2	46	9	27	4	51	34
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked												
vC, conflicting volume	353			1032			1422	1365	1006	1370	1390	352
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	353			1032			1422	1365	1006	1370	1390	352
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			41	94	91	96	64	95
cM capacity (veh/h)	1206			673			78	147	293	107	142	692

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	2	1032	1	353	82	89
Volume Left	2	0	1	0	46	4
Volume Right	0	52	0	2	27	34
cSH	1206	1700	673	1700	110	199
Volume to Capacity	0.00	0.61	0.00	0.21	0.75	0.45
Queue Length 95th (ft)	0	0	0	0	102	52
Control Delay (s)	8.0	0.0	10.4	0.0	99.9	36.8
Lane LOS	A		B		F	E
Approach Delay (s)	0.0		0.0		99.9	36.8
Approach LOS					F	E

Intersection Summary				
Average Delay	7.4			
Intersection Capacity Utilization	66.8%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

11/13/2018

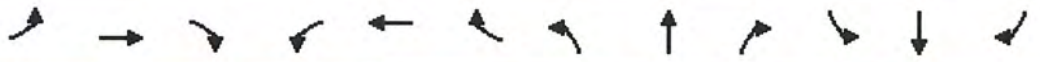
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	271	239	37	185	7	300	457	16	0	323	104
Future Volume (vph)	86	271	239	37	185	7	300	457	16	0	323	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost 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		1.00	0.95			0.95	
Frt	1.00	0.93		1.00	0.99		1.00	0.99			0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)	1770	1732		1770	1853		1770	3521			3410	
Flt Permitted	0.56	1.00		0.11	1.00		0.95	1.00			1.00	
Satd. Flow (perm)	1046	1732		199	1853		1770	3521			3410	
Peak-hour factor, PHF	0.64	0.64	0.64	0.83	0.83	0.83	0.81	0.81	0.81	0.58	0.58	0.58
Adj. Flow (vph)	134	423	373	45	223	8	370	564	20	0	557	179
RTOR Reduction (vph)	0	35	0	0	1	0	0	2	0	0	34	0
Lane Group Flow (vph)	134	761	0	45	230	0	370	582	0	0	702	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	37.5	37.5		37.5	37.5		19.3	43.5			19.7	
Effective Green, g (s)	37.5	37.5		37.5	37.5		19.3	43.5			19.7	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.21	0.48			0.22	
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)	435	721		82	772		379	1701			746	
v/s Ratio Prot		c0.44			0.12		c0.21	0.17			c0.21	
v/s Ratio Perm	0.13			0.23								
v/c Ratio	0.31	1.06		0.55	0.30		0.98	0.34			0.94	
Uniform Delay, d1	17.6	26.2		19.9	17.5		35.1	14.4			34.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	49.1		7.3	0.2		39.5	0.5			21.3	
Delay (s)	18.0	75.4		27.2	17.7		74.7	14.9			55.8	
Level of Service	B	E		C	B		E	B			E	
Approach Delay (s)		67.1			19.2			38.1			55.8	
Approach LOS		E			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	50.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

11/13/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	18	46	0	5	5	9	687	3	0	474	11
Future Volume (Veh/h)	10	18	46	0	5	5	9	687	3	0	474	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.56	0.56	0.56	0.75	0.75	0.75	0.71	0.71	0.71	0.86	0.86	0.86
Hourly flow rate (vph)	18	32	82	0	7	7	13	968	4	0	551	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.91	0.91		0.91	0.91	0.91				0.91		
vC, conflicting volume	1078	1556	282	1370	1560	486	564			972		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	877	1404	282	1199	1409	223	564			760		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	74	89	100	94	99	99			100		
cM capacity (veh/h)	206	124	715	90	123	707	1004			767		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	132	14	13	645	327	0	367	197
Volume Left	18	0	13	0	0	0	0	0
Volume Right	82	7	0	0	4	0	0	13
cSH	286	209	1004	1700	1700	1700	1700	1700
Volume to Capacity	0.46	0.07	0.01	0.38	0.19	0.00	0.22	0.12
Queue Length 95th (ft)	57	5	1	0	0	0	0	0
Control Delay (s)	27.9	23.4	8.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C	A					
Approach Delay (s)	27.9	23.4	0.1			0.0		
Approach LOS	D	C						

Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	36.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	16	15	90	9	43	99
Future Volume (Veh/h)	16	15	90	9	43	99
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.83	0.83	0.63	0.63
Hourly flow rate (vph)	32	30	108	11	68	157
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	406	114			119	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	406	114			119	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	97			95	
cM capacity (veh/h)	573	939			1469	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	62	119	225
Volume Left	32	0	68
Volume Right	30	11	0
cSH	706	1700	1469
Volume to Capacity	0.09	0.07	0.05
Queue Length 95th (ft)	7	0	4
Control Delay (s)	10.6	0.0	2.6
Lane LOS	B		A
Approach Delay (s)	10.6	0.0	2.6
Approach LOS	B		

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	5	8	18	41	148	19	913	17	58	581	10
Future Volume (vph)	7	5	8	18	41	148	19	913	17	58	581	10
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.88		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1688		1770	1644		1770	3529		1770	3530	
Flt Permitted	0.36	1.00		0.75	1.00		0.41	1.00		0.23	1.00	
Satd. Flow (perm)	677	1688		1392	1644		759	3529		423	3530	
Peak-hour factor, PHF	0.80	0.80	0.80	0.66	0.66	0.66	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	9	6	10	27	62	224	21	1003	19	63	632	11
RTOR Reduction (vph)	0	9	0	0	156	0	0	1	0	0	1	0
Lane Group Flow (vph)	9	7	0	27	130	0	21	1021	0	63	642	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.0	11.0		11.0	11.0		48.7	46.7		52.1	48.4	
Effective Green, g (s)	11.0	11.0		11.0	11.0		48.7	46.7		52.1	48.4	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.65	0.62		0.70	0.65	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	99	247		204	241		520	2200		360	2281	
v/s Ratio Prot		0.00			c0.08		0.00	c0.29		c0.01	0.18	
v/s Ratio Perm	0.01			0.02			0.03			0.11		
v/c Ratio	0.09	0.03		0.13	0.54		0.04	0.46		0.17	0.28	
Uniform Delay, d1	27.6	27.4		27.8	29.6		4.6	7.5		4.2	5.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.0		0.3	2.3		0.0	0.7		0.2	0.3	
Delay (s)	28.0	27.4		28.1	31.9		4.7	8.2		4.5	6.0	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		27.6			31.6			8.1			5.9	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	74.9	Sum of lost time (s)	13.5
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	7	106	31	25	143	11	49	26	35	13	83	13
Future Volume (Veh/h)	7	106	31	25	143	11	49	26	35	13	83	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.81	0.81	0.81	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	10	154	45	31	177	14	58	31	42	15	99	15
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	191			199			507	450	176	500	465	184
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	191			199			507	450	176	500	465	184
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			85	94	95	96	79	98
cM capacity (veh/h)	1383			1373			385	490	867	426	480	858

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	209	222	131	129
Volume Left	10	31	58	15
Volume Right	45	14	42	15
cSH	1383	1373	499	498
Volume to Capacity	0.01	0.02	0.26	0.26
Queue Length 95th (ft)	1	2	26	26
Control Delay (s)	0.4	1.2	14.8	14.7
Lane LOS	A	A	B	B
Approach Delay (s)	0.4	1.2	14.8	14.7
Approach LOS			B	B

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	169	102	47	97	25	292	895	96	171	480	29
Future Volume (vph)	38	169	102	47	97	25	292	895	96	171	480	29
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.99	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1846	1385		1833	1385	1770	3488		1770	3509	
Flt Permitted		0.82	1.00		0.61	1.00	0.36	1.00		0.17	1.00	
Satd. Flow (perm)		1522	1385		1133	1385	674	3488		309	3509	
Peak-hour factor, PHF	0.77	0.77	0.77	0.57	0.57	0.57	0.89	0.89	0.89	0.96	0.96	0.96
Adj. Flow (vph)	49	219	132	82	170	44	328	1006	108	178	500	30
RTOR Reduction (vph)	0	0	99	0	0	33	0	8	0	0	4	0
Lane Group Flow (vph)	0	268	33	0	252	11	328	1106	0	178	526	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		20.4	20.4		20.4	20.4	51.7	38.9		43.9	35.0	
Effective Green, g (s)		20.4	20.4		20.4	20.4	51.7	38.9		43.9	35.0	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.63	0.48		0.54	0.43	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		380	345		282	345	598	1660		325	1503	
v/s Ratio Prot							c0.09	c0.32		0.06	0.15	
v/s Ratio Perm		0.18	0.02		c0.22	0.01	0.26			0.23		
v/c Ratio		0.71	0.10		0.89	0.03	0.55	0.67		0.55	0.35	
Uniform Delay, d1		27.9	23.6		29.6	23.2	7.4	16.4		11.2	15.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.9	0.1		27.9	0.0	1.0	2.1		1.9	0.6	
Delay (s)		33.8	23.7		57.5	23.2	8.4	18.5		13.1	16.3	
Level of Service		C	C		E	C	A	B		B	B	
Approach Delay (s)		30.4			52.4			16.2			15.5	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	81.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	454	22	12	463	4	58	78	29	2	61	4
Future Volume (Veh/h)	3	454	22	12	463	4	58	78	29	2	61	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.63	0.63	0.63	0.58	0.58	0.58	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	5	721	35	21	798	7	88	118	44	3	92	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked	0.98						0.98	0.98		0.98	0.98	0.98
vC, conflicting volume	805			756			1640	1596	738	1678	1610	802
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	793			756			1643	1597	738	1681	1611	789
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			0	0	89	0	7	98
cM capacity (veh/h)	814			855			14	101	418	0	99	384

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	756	21	805	250	101
Volume Left	5	0	21	0	88	3
Volume Right	0	35	0	7	44	6
cSH	814	1700	855	1700	33	0
Volume to Capacity	0.01	0.44	0.02	0.47	7.47	Err
Queue Length 95th (ft)	0	0	2	0	Err	Err
Control Delay (s)	9.5	0.0	9.3	0.0	Err	Err
Lane LOS	A		A		F	F
Approach Delay (s)	0.1		0.2		Err	Err
Approach LOS					F	F

Intersection Summary				
Average Delay	Err			
Intersection Capacity Utilization	47.6%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	192	197	22	118	3	375	599	14	180	231	77
Future Volume (vph)	65	192	197	22	118	3	375	599	14	180	231	77
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1721		1770	1855		1770	3527		1770	3406	
Flt Permitted	0.65	1.00		0.12	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1209	1721		220	1855		1770	3527		1770	3406	
Peak-hour factor, PHF	0.58	0.58	0.58	0.80	0.80	0.80	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	112	331	340	28	148	4	408	651	15	191	246	82
RTOR Reduction (vph)	0	41	0	0	1	0	0	2	0	0	36	0
Lane Group Flow (vph)	112	630	0	28	151	0	408	664	0	191	292	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	33.8	33.8		33.8	33.8		22.0	28.8		12.7	19.5	
Effective Green, g (s)	33.8	33.8		33.8	33.8		22.0	28.8		12.7	19.5	
Actuated g/C Ratio	0.38	0.38		0.38	0.38		0.25	0.32		0.14	0.22	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	460	655		83	706		438	1143		253	747	
v/s Ratio Prot		c0.37			0.08		c0.23	c0.19		0.11	0.09	
v/s Ratio Perm	0.09			0.13								
v/c Ratio	0.24	0.96		0.34	0.21		0.93	0.58		0.75	0.39	
Uniform Delay, d1	18.8	26.9		19.5	18.5		32.7	25.0		36.6	29.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	25.7		2.4	0.2		26.6	2.2		12.1	1.5	
Delay (s)	19.0	52.6		22.0	18.7		59.3	27.1		48.6	31.1	
Level of Service	B	D		C	B		E	C		D	C	
Approach Delay (s)		47.8			19.2			39.3			37.6	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	40.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	88.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

10/28/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	16	45	3	14	5	5	635	8	4	529	6
Future Volume (Veh/h)	14	16	45	3	14	5	5	635	8	4	529	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.83	0.83	0.83	0.88	0.88	0.88
Hourly flow rate (vph)	24	28	78	5	24	9	6	765	10	5	601	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.85	0.85		0.85	0.85	0.85				0.85		
vC, conflicting volume	1030	1402	304	1184	1400	388	608			775		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	676	1114	304	858	1112	0	608			375		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	84	89	97	86	99	99			100		
cM capacity (veh/h)	253	173	692	164	174	919	966			1000		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	130	38	6	510	265	5	401	207
Volume Left	24	5	6	0	0	5	0	0
Volume Right	78	9	0	0	10	0	0	7
cSH	352	213	966	1700	1700	1000	1700	1700
Volume to Capacity	0.37	0.18	0.01	0.30	0.16	0.00	0.24	0.12
Queue Length 95th (ft)	41	16	0	0	0	0	0	0
Control Delay (s)	21.1	25.5	8.7	0.0	0.0	8.6	0.0	0.0
Lane LOS	C	D	A			A		
Approach Delay (s)	21.1	25.5	0.1			0.1		
Approach LOS	C	D						

Intersection Summary				
Average Delay	2.4			
Intersection Capacity Utilization	31.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	16	94	9	45	103
Future Volume (Veh/h)	17	16	94	9	45	103
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.83	0.83	0.63	0.63
Hourly flow rate (vph)	34	32	113	11	71	163
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	424	118			124	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	424	118			124	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	97			95	
cM capacity (veh/h)	559	933			1463	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	66	124	234
Volume Left	34	0	71
Volume Right	32	11	0
cSH	694	1700	1463
Volume to Capacity	0.10	0.07	0.05
Queue Length 95th (ft)	8	0	4
Control Delay (s)	10.7	0.0	2.6
Lane LOS	B		A
Approach Delay (s)	10.7	0.0	2.6
Approach LOS	B		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

11/13/2018

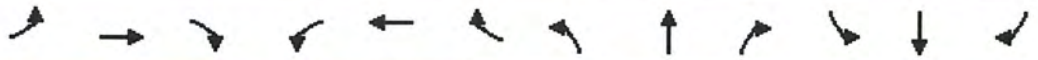
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	5	8	19	43	154	20	950	18	60	605	10
Future Volume (vph)	7	5	8	19	43	154	20	950	18	60	605	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.91		1.00	0.88		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1688		1770	1644		1770	3529		1770	3530	
Flt Permitted	0.34	1.00		0.75	1.00		0.40	1.00		0.20	1.00	
Satd. Flow (perm)	631	1688		1392	1644		740	3529		379	3530	
Peak-hour factor, PHF	0.80	0.80	0.80	0.66	0.66	0.66	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	9	6	10	29	65	233	22	1044	20	65	658	11
RTOR Reduction (vph)	0	8	0	0	149	0	0	1	0	0	1	0
Lane Group Flow (vph)	9	8	0	29	149	0	22	1063	0	65	668	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.8	11.8		11.8	11.8		48.9	46.9		54.9	49.9	
Effective Green, g (s)	11.8	11.8		11.8	11.8		48.9	46.9		54.9	49.9	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.63	0.61		0.71	0.65	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	96	258		212	251		495	2143		359	2281	
v/s Ratio Prot		0.00			c0.09		0.00	c0.30		c0.01	0.19	
v/s Ratio Perm	0.01			0.02			0.03			0.12		
v/c Ratio	0.09	0.03		0.14	0.59		0.04	0.50		0.18	0.29	
Uniform Delay, d1	28.1	27.8		28.3	30.5		5.3	8.5		4.4	6.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.0		0.3	3.7		0.0	0.8		0.2	0.3	
Delay (s)	28.5	27.9		28.6	34.2		5.3	9.3		4.7	6.3	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		28.1			33.7			9.3			6.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	77.2	Sum of lost time (s)	13.5
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

11/13/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	7	110	32	26	149	11	51	27	36	14	86	14
Future Volume (Veh/h)	7	110	32	26	149	11	51	27	36	14	86	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.81	0.81	0.81	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	10	159	46	32	184	14	61	32	43	17	102	17
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	198			205			525	464	182	516	480	191
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	198			205			525	464	182	516	480	191
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			83	93	95	96	78	98
cM capacity (veh/h)	1375			1366			370	480	861	414	470	851

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	215	230	136	136
Volume Left	10	32	61	17
Volume Right	46	14	43	17
cSH	1375	1366	483	489
Volume to Capacity	0.01	0.02	0.28	0.28
Queue Length 95th (ft)	1	2	29	28
Control Delay (s)	0.4	1.2	15.4	15.2
Lane LOS	A	A	C	C
Approach Delay (s)	0.4	1.2	15.4	15.2
Approach LOS			C	C

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	176	106	49	101	26	304	931	100	178	499	30
Future Volume (vph)	40	176	106	49	101	26	304	931	100	178	499	30
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	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.99	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1846	1385		1833	1385	1770	3488		1770	3509	
Flt Permitted		0.80	1.00		0.60	1.00	0.34	1.00		0.15	1.00	
Satd. Flow (perm)		1499	1385		1111	1385	630	3488		275	3509	
Peak-hour factor, PHF	0.77	0.77	0.77	0.57	0.57	0.57	0.89	0.89	0.89	0.96	0.96	0.96
Adj. Flow (vph)	52	229	138	86	177	46	342	1046	112	185	520	31
RTOR Reduction (vph)	0	0	102	0	0	34	0	9	0	0	4	0
Lane Group Flow (vph)	0	281	36	0	263	12	342	1149	0	185	547	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		21.6	21.6		21.6	21.6	52.0	38.6		43.0	34.1	
Effective Green, g (s)		21.6	21.6		21.6	21.6	52.0	38.6		43.0	34.1	
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.63	0.47		0.52	0.41	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		391	362		290	362	581	1629		304	1448	
v/s Ratio Prot							c0.10	c0.33		0.07	0.16	
v/s Ratio Perm		0.19	0.03		c0.24	0.01	0.27			0.25		
v/c Ratio		0.72	0.10		0.91	0.03	0.59	0.71		0.61	0.38	
Uniform Delay, d1		27.7	23.1		29.5	22.7	7.9	17.5		12.5	16.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.2	0.1		29.7	0.0	1.5	2.6		3.4	0.8	
Delay (s)		33.9	23.2		59.2	22.8	9.4	20.1		15.9	17.6	
Level of Service		C	C		E	C	A	C		B	B	
Approach Delay (s)		30.4			53.8			17.7			17.2	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	82.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	472	23	12	482	4	60	81	30	2	63	4
Future Volume (Veh/h)	3	472	23	12	482	4	60	81	30	2	63	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.63	0.63	0.63	0.58	0.58	0.58	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	5	749	37	21	831	7	91	123	45	3	95	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked	0.98						0.98	0.98		0.98	0.98	0.98
vC, conflicting volume	838			786			1704	1658	768	1742	1672	834
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	823			786			1709	1661	768	1747	1676	820
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			0	0	89	0	0	98
cM capacity (veh/h)	789			833			0	92	402	0	90	367

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	786	21	838	259	104
Volume Left	5	0	21	0	91	3
Volume Right	0	37	0	7	45	6
cSH	789	1700	833	1700	0	0
Volume to Capacity	0.01	0.46	0.03	0.49	Err	Err
Queue Length 95th (ft)	0	0	2	0	Err	Err
Control Delay (s)	9.6	0.0	9.4	0.0	Err	Err
Lane LOS	A		A		F	F
Approach Delay (s)	0.1		0.2		Err	Err
Approach LOS					F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	200	205	23	123	3	390	623	15	187	240	80
Future Volume (vph)	68	200	205	23	123	3	390	623	15	187	240	80
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1721		1770	1856		1770	3527		1770	3406	
Flt Permitted	0.64	1.00		0.12	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1194	1721		216	1856		1770	3527		1770	3406	
Peak-hour factor, PHF	0.58	0.58	0.58	0.80	0.80	0.80	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	117	345	353	29	154	4	424	677	16	199	255	85
RTOR Reduction (vph)	0	41	0	0	1	0	0	2	0	0	36	0
Lane Group Flow (vph)	117	657	0	29	157	0	424	691	0	199	304	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.5	34.5		34.5	34.5		22.7	28.7		13.1	19.1	
Effective Green, g (s)	34.5	34.5		34.5	34.5		22.7	28.7		13.1	19.1	
Actuated g/C Ratio	0.38	0.38		0.38	0.38		0.25	0.32		0.15	0.21	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	458	661		82	713		447	1127		258	724	
v/s Ratio Prot		c0.38			0.08		c0.24	c0.20		0.11	0.09	
v/s Ratio Perm	0.10			0.13								
v/c Ratio	0.26	0.99		0.35	0.22		0.95	0.61		0.77	0.42	
Uniform Delay, d1	18.9	27.6		19.7	18.6		33.0	25.9		36.9	30.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	33.4		2.6	0.2		29.5	2.5		13.3	1.8	
Delay (s)	19.2	61.0		22.3	18.8		62.5	28.3		50.2	32.3	
Level of Service	B	E		C	B		E	C		D	C	
Approach Delay (s)		55.0			19.3			41.3			38.9	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	43.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	89.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	17	47	3	15	5	5	661	8	4	550	6
Future Volume (Veh/h)	15	17	47	3	15	5	5	661	8	4	550	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.83	0.83	0.83	0.88	0.88	0.88
Hourly flow rate (vph)	26	29	81	5	26	9	6	796	10	5	625	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.84	0.84		0.84	0.84	0.84				0.84		
vC, conflicting volume	1070	1456	316	1231	1455	403	632			806		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	698	1159	316	889	1157	0	632			382		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	82	88	97	84	99	99			99		
cM capacity (veh/h)	236	161	680	150	162	909	947			983		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	136	40	6	531	275	5	417	215
Volume Left	26	5	6	0	0	5	0	0
Volume Right	81	9	0	0	10	0	0	7
cSH	332	196	947	1700	1700	983	1700	1700
Volume to Capacity	0.41	0.20	0.01	0.31	0.16	0.01	0.25	0.13
Queue Length 95th (ft)	48	19	0	0	0	0	0	0
Control Delay (s)	23.1	28.0	8.8	0.0	0.0	8.7	0.0	0.0
Lane LOS	C	D	A			A		
Approach Delay (s)	23.1	28.0	0.1			0.1		
Approach LOS	C	D						

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	17	19	94	9	48	103
Future Volume (Veh/h)	17	19	94	9	48	103
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.50	0.83	0.83	0.63	0.63
Hourly flow rate (vph)	34	38	113	11	76	163
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	434	118			124	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	434	118			124	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	96			95	
cM capacity (veh/h)	549	933			1463	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	72	124	239
Volume Left	34	0	76
Volume Right	38	11	0
cSH	702	1700	1463
Volume to Capacity	0.10	0.07	0.05
Queue Length 95th (ft)	9	0	4
Control Delay (s)	10.7	0.0	2.7
Lane LOS	B		A
Approach Delay (s)	10.7	0.0	2.7
Approach LOS	B		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	24.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
2: Park Ave & S 1st St

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	5	11	19	43	154	23	949	18	60	604	10
Future Volume (vph)	7	5	11	19	43	154	23	949	18	60	604	10
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.90		1.00	0.88		1.00	1.00		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1667		1770	1644		1770	3529		1770	3530	
Flt Permitted	0.34	1.00		0.74	1.00		0.40	1.00		0.20	1.00	
Satd. Flow (perm)	631	1667		1386	1644		741	3529		379	3530	
Peak-hour factor, PHF	0.80	0.80	0.80	0.66	0.66	0.66	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	9	6	14	29	65	233	25	1043	20	65	657	11
RTOR Reduction (vph)	0	12	0	0	149	0	0	1	0	0	1	0
Lane Group Flow (vph)	9	8	0	29	149	0	25	1062	0	65	667	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.8	11.8		11.8	11.8		48.9	46.9		54.9	49.9	
Effective Green, g (s)	11.8	11.8		11.8	11.8		48.9	46.9		54.9	49.9	
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.63	0.61		0.71	0.65	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	96	254		211	251		496	2143		359	2281	
v/s Ratio Prot		0.00			c0.09		0.00	c0.30		c0.01	0.19	
v/s Ratio Perm	0.01			0.02			0.03			0.12		
v/c Ratio	0.09	0.03		0.14	0.59		0.05	0.50		0.18	0.29	
Uniform Delay, d1	28.1	27.8		28.3	30.5		5.3	8.5		4.4	6.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.1		0.3	3.7		0.0	0.8		0.2	0.3	
Delay (s)	28.5	27.9		28.6	34.2		5.3	9.3		4.7	6.3	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		28.1			33.7			9.2			6.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	77.2	Sum of lost time (s)	13.5
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: S 3rd St & Naches Ave

11/13/2018

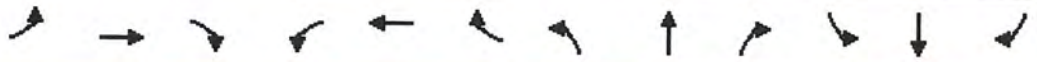
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	6	110	32	42	149	11	51	35	53	14	92	13
Future Volume (Veh/h)	6	110	32	42	149	11	51	35	53	14	92	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.69	0.69	0.69	0.81	0.81	0.81	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	9	159	46	52	184	14	61	42	63	17	110	15
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					670							
pX, platoon unblocked												
vC, conflicting volume	198			205			565	502	182	579	518	191
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	198			205			565	502	182	579	518	191
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			96			82	91	93	95	75	98
cM capacity (veh/h)	1375			1366			334	451	861	355	441	851

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	214	250	166	142
Volume Left	9	52	61	17
Volume Right	46	14	63	15
cSH	1375	1366	476	451
Volume to Capacity	0.01	0.04	0.35	0.31
Queue Length 95th (ft)	0	3	39	33
Control Delay (s)	0.4	1.9	16.6	16.6
Lane LOS	A	A	C	C
Approach Delay (s)	0.4	1.9	16.6	16.6
Approach LOS			C	C

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
4: S 1st St/N 1st St & Naches Ave

11/13/2018



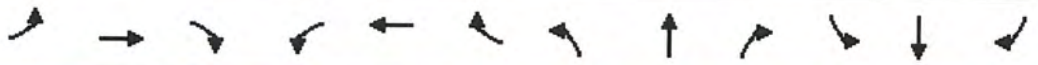
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	51	182	106	49	107	26	304	930	100	178	498	40
Future Volume (vph)	51	182	106	49	107	26	304	930	100	178	498	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.99	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1843	1385		1834	1385	1770	3488		1770	3499	
Flt Permitted		0.74	1.00		0.58	1.00	0.33	1.00		0.14	1.00	
Satd. Flow (perm)		1370	1385		1089	1385	612	3488		267	3499	
Peak-hour factor, PHF	0.77	0.77	0.77	0.57	0.57	0.57	0.89	0.89	0.89	0.96	0.96	0.96
Adj. Flow (vph)	66	236	138	86	188	46	342	1045	112	185	519	42
RTOR Reduction (vph)	0	0	100	0	0	33	0	9	0	0	6	0
Lane Group Flow (vph)	0	302	38	0	274	13	342	1148	0	185	555	0
Parking (#/hr)			5			5						
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		23.0	23.0		23.0	23.0	52.1	38.6		42.9	33.9	
Effective Green, g (s)		23.0	23.0		23.0	23.0	52.1	38.6		42.9	33.9	
Actuated g/C Ratio		0.27	0.27		0.27	0.27	0.62	0.46		0.51	0.40	
Clearance Time (s)		4.5	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	3.0	
Lane Grp Cap (vph)		374	378		297	378	567	1600		297	1410	
v/s Ratio Prot							c0.10	c0.33		0.07	0.16	
v/s Ratio Perm		0.22	0.03		c0.25	0.01	0.28			0.25		
v/c Ratio		0.81	0.10		0.92	0.03	0.60	0.72		0.62	0.39	
Uniform Delay, d1		28.5	22.8		29.7	22.4	8.5	18.4		13.2	17.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		12.1	0.1		32.6	0.0	1.8	2.8		4.0	0.8	
Delay (s)		40.5	22.9		62.2	22.4	10.3	21.2		17.3	18.6	
Level of Service		D	C		E	C	B	C		B	B	
Approach Delay (s)		35.0			56.5			18.7			18.3	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM 2000 Control Delay	25.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	84.1	Sum of lost time (s)	13.5
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

11/13/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	472	30	12	482	4	68	80	30	2	62	2
Future Volume (Veh/h)	1	472	30	12	482	4	68	80	30	2	62	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.63	0.63	0.63	0.58	0.58	0.58	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	2	749	48	21	831	7	103	121	45	3	94	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					665							
pX, platoon unblocked	0.98						0.98	0.98		0.98	0.98	0.98
vC, conflicting volume	838			797			1700	1657	773	1735	1678	834
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	823			797			1704	1661	773	1740	1681	820
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			0	0	89	0	0	99
cM capacity (veh/h)	789			825			0	93	399	0	90	367

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	2	797	21	838	269	100
Volume Left	2	0	21	0	103	3
Volume Right	0	48	0	7	45	3
cSH	789	1700	825	1700	0	0
Volume to Capacity	0.00	0.47	0.03	0.49	Err	Err
Queue Length 95th (ft)	0	0	2	0	Err	Err
Control Delay (s)	9.6	0.0	9.5	0.0	Err	Err
Lane LOS	A		A		F	F
Approach Delay (s)	0.0		0.2		Err	Err
Approach LOS					F	F

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
6: N 1st St & Fremont Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	200	205	23	123	3	390	633	15	187	249	80
Future Volume (vph)	68	200	205	23	123	3	390	633	15	187	249	80
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	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	1.00		1.00	1.00		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1721		1770	1856		1770	3527		1770	3410	
Flt Permitted	0.64	1.00		0.12	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1194	1721		216	1856		1770	3527		1770	3410	
Peak-hour factor, PHF	0.58	0.58	0.58	0.80	0.80	0.80	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	117	345	353	29	154	4	424	688	16	199	265	85
RTOR Reduction (vph)	0	41	0	0	1	0	0	2	0	0	35	0
Lane Group Flow (vph)	117	657	0	29	157	0	424	702	0	199	315	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	34.5	34.5		34.5	34.5		22.7	28.7		13.1	19.1	
Effective Green, g (s)	34.5	34.5		34.5	34.5		22.7	28.7		13.1	19.1	
Actuated g/C Ratio	0.38	0.38		0.38	0.38		0.25	0.32		0.15	0.21	
Clearance Time (s)	4.5	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	3.0	
Lane Grp Cap (vph)	458	661		82	713		447	1127		258	725	
v/s Ratio Prot		c0.38			0.08		c0.24	c0.20		0.11	0.09	
v/s Ratio Perm	0.10			0.13								
v/c Ratio	0.26	0.99		0.35	0.22		0.95	0.62		0.77	0.43	
Uniform Delay, d1	18.9	27.6		19.7	18.6		33.0	26.0		36.9	30.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	33.4		2.6	0.2		29.5	2.6		13.3	1.9	
Delay (s)	19.2	61.0		22.3	18.8		62.5	28.6		50.2	32.6	
Level of Service	B	E		C	B		E	C		D	C	
Approach Delay (s)		55.0			19.3			41.3			39.0	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	43.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	89.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: N 1st St & Bartlett Ave

11/13/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	16	46	3	14	5	4	670	8	4	559	4
Future Volume (Veh/h)	13	16	46	3	14	5	4	670	8	4	559	4
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.83	0.83	0.83	0.88	0.88	0.88
Hourly flow rate (vph)	22	28	79	5	24	9	5	807	10	5	635	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								361				
pX, platoon unblocked	0.83	0.83		0.83	0.83	0.83				0.83		
vC, conflicting volume	1082	1474	320	1242	1472	408	640			817		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	702	1172	320	894	1169	0	640			384		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	82	88	97	85	99	99			99		
cM capacity (veh/h)	235	158	676	149	158	905	940			977		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	129	38	5	538	279	5	423	217
Volume Left	22	5	5	0	0	5	0	0
Volume Right	79	9	0	0	10	0	0	5
cSH	333	195	940	1700	1700	977	1700	1700
Volume to Capacity	0.39	0.20	0.01	0.32	0.16	0.01	0.25	0.13
Queue Length 95th (ft)	44	18	0	0	0	0	0	0
Control Delay (s)	22.5	27.9	8.8	0.0	0.0	8.7	0.0	0.0
Lane LOS	C	D	A			A		
Approach Delay (s)	22.5	27.9	0.1			0.1		
Approach LOS	C	D						

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
5: Fremont Ave & N 3rd St

11/14/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	472	30	12	482	4	68	80	30	2	62	2
Future Volume (vph)	1	472	30	12	482	4	68	80	30	2	62	2
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	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.98			1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)	1770	1846		1770	1860			1563			1621	
Flt Permitted	0.15	1.00		0.18	1.00			0.84			0.99	
Satd. Flow (perm)	274	1846		329	1860			1331			1607	
Peak-hour factor, PHF	0.63	0.63	0.63	0.58	0.58	0.58	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	2	749	48	21	831	7	103	121	45	3	94	3
RTOR Reduction (vph)	0	4	0	0	0	0	0	13	0	0	2	0
Lane Group Flow (vph)	2	793	0	21	838	0	0	256	0	0	98	0
Parking (#/hr)							5	5	5	5	5	5
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	27.2	27.2		27.2	27.2			14.3			14.3	
Effective Green, g (s)	27.2	27.2		27.2	27.2			14.3			14.3	
Actuated g/C Ratio	0.54	0.54		0.54	0.54			0.28			0.28	
Clearance Time (s)	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	
Lane Grp Cap (vph)	147	994		177	1001			376			455	
v/s Ratio Prot		0.43			c0.45							
v/s Ratio Perm	0.01			0.06				c0.19			0.06	
v/c Ratio	0.01	0.80		0.12	0.84			0.68			0.22	
Uniform Delay, d1	5.4	9.4		5.7	9.8			16.1			13.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	4.5		0.3	6.2			5.0			0.2	
Delay (s)	5.5	14.0		6.0	16.0			21.1			14.1	
Level of Service	A	B		A	B			C			B	
Approach Delay (s)		13.9			15.7			21.1			14.1	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

11.50.110 Critical aquifer recharge areas.

(c) Performance Standards. In addition to the general provisions of this chapter and the requirements of the underlying land use zoning, the following minimum standards shall apply to development activities within and adjacent to aquifer recharge areas:

(10) Vehicle repair and servicing activities must be conducted over impermeable pads and within covered structures capable of withstanding normally expected weather conditions. Chemicals used in the process of vehicle repair and servicing must be stored in a manner that protects them from weather and provides containment should leaks occur. No dry wells shall be allowed in CARAs on sites used for vehicle repair and servicing. Dry wells existing on the site prior to facility establishment must be abandoned using techniques approved by the State Department of Ecology prior to commencement of the proposed activity.

RCW 35.68.075

Curb ramps for persons with disabilities—Required—Standards and requirements.

(1) The standard for construction on any county road, or city or town street, for which curbs in combination with sidewalks, paths, or other pedestrian access ways are to be constructed, shall be not less than two ramps per lineal block on or near the crosswalks at intersections. Such ramps shall be at least thirty-six inches wide and so constructed as to allow reasonable access to the crosswalk for physically handicapped persons, without uniquely endangering blind persons.

(2) Standards set for curb ramping under subsection (1) of this section shall not apply to any curb existing upon enactment of this section but shall apply to all new curb construction and to all replacement curbs constructed at any point in a block which gives reasonable access to a crosswalk.

(3) Upon September 21, 1977, every ramp thereafter constructed under subsection (1) of this section, which serves one end of a crosswalk, shall be matched by another ramp at the other end of the crosswalk. However, no ramp shall be required at the other end of the crosswalk if there is no curb nor sidewalk at the other end of the crosswalk. Nor shall any matching ramp constructed pursuant to this subsection require a subsequent matching ramp.

[1989 c 173 § 1; 1977 ex.s. c 137 § 1; 1973 c 83 § 1.]

CITY OF SELAH

S Third St - Selah Ave to Naches Ave
Engineer's Opinion of Construction Cost

1/8/2019

HLA Project No. 19006G

Item No.	Description	Unit	Unit Cost	Overall Quantity	Overall Cost
Schedule A: Grind and Overlay					
1	Mobilization	LS	$10,000.00	1	$10,000.00
2	Project Temporary Traffic Control	LS	$5,000.00	1	$5,000.00
3	Planing Bituminous Pavement	SY	$4.00	4,110	$16,440.00
4	Crushed Surfacing Top Course	TON	$40.00	80	$3,200.00
5	HMA Cl. 1/2-Inch PG 64-28	TON	$100.00	730	$73,000.00
6	HMA for Pavement Repair	SY	$60.00	50	$3,000.00
7	Adjust Manhole	EA	$700.00	5	$3,500.00
8	Adjust Valve Box	EA	$600.00	6	$3,600.00
9	Adjust Catch Basin	EA	$500.00	1	$500.00
10	Pavement Markings	LS	$2,500.00	1	$2,500.00
			Sch. A Subtotal		$120,740.00
Assumptions			Contingency	10%	$12,100.00
1.	0.25' HMA Grind and Overlay		**Estimated Sch. A Construction Cost**		**$132,840.00**
			Design Engineering	10%	$13,280.00
			Construction Engineering	10%	$13,280.00
			Total Estimated Sch. A Project Cost		**$159,400.00**
Schedule B: East Side Widening, Curb and Gutter, Sidewalk and Storm Drainage (Park Ave. to Naches Ave.)					
11	Mobilization	LS	$11,000.00	1	$11,000.00
12	Project Temporary Traffic Control	LS	$10,000.00	1	$10,000.00
13	Unclassified Excavation	CY	$60.00	360	$21,600.00
14	Crushed Surfacing Base Course	TON	$35.00	300	$10,500.00
15	Select Backfill	CY	$100.00	10	$1,000.00
16	HMA Cl. 1/2-Inch PG 64-28	TON	$125.00	220	$27,500.00
17	12-Inch Storm Drain Pipe	LF	$70.00	15	$1,050.00
18	Catch Basin Type 1	EA	$1,500.00	3	$4,500.00
19	Catch Basin Type 2	EA	$3,000.00	3	$9,000.00
20	Infiltration Trench 12-Inch Diam. Perforated Pipe	EA	$100.00	180	$18,000.00
21	Shoring or Extra Excavation	LF	$5.00	180	$900.00
22	Cement Conc. Traffic Curb and Gutter	LF	$20.00	950	$19,000.00
23	Cement Conc. Sidewalk	SY	$70.00	630	$44,100.00
24	Cement Conc. Sidewalk Ramp	EA	$1,500.00	3	$4,500.00
			Sch B. Subtotal		$182,650.00
			Contingency	10%	$18,300.00
1.	33' wide paved road width		**Estimated Sch. B Construction Cost**		**$200,950.00**
2.	0.42' HMA over 0.58' CSBC to match existing		Design Engineering	12%	$24,110.00
			Construction Engineering	13%	$26,120.00
			Total Estimated Sch. B Project Cost		**$251,180.00**
			Total Sch. A + Sch. B		**$410,580.00**

Terry D. Alapeteri, PE
HLA Engineering and Land Surveying, Inc.

1/08/19
Date

CITY OF SELAH
S Third St - Naches Ave to Fremont Ave
Engineer's Opinion of Construction Cost

1/8/2019

HLA Project No. 19006G

Item No.	Description	Unit	Unit Cost	Overall Quantity	Overall Cost
1	Mobilization	LS	$7,000.00	1	$7,000.00
2	Project Temporary Traffic Control	LS	$5,000.00	1	$5,000.00
3	Planing Bituminous Pavement	SY	$4.00	2,390	$9,560.00
4	HMA Cl. 1/2-Inch PG 64-28	TON	$100.00	510	$51,000.00
5	HMA for Pavement Repair	SY	$60.00	50	$3,000.00
6	Adjust Manhole	EA	$700.00	2	$1,400.00
7	Adjust Valve Box	EA	$600.00	2	$1,200.00
8	Pavement Markings	LS	$2,000.00	1	$2,000.00
				Subtotal	$80,160.00
				Contingency 10%	$8,000.00
			Estimated Construction Cost		**$88,160.00**
				Design Engineering 12%	$10,580.00
				Construction Engineering 12%	$10,580.00
			Total Estimated Project Cost		**$109,320.00**

Assumptions
1. 0.17' Grind and 0.30' HMA Overlay

Terry D. Alapeteri, PE
HLA Engineering and Land Surveying, Inc.

1/08/19
Date

CITY OF SELAH

Park Avenue Sidewalk (South side West of Civic Center parking lot) 1/9/2019

Engineer's Opinion of Construction Cost

HLA Project No. 19006G

Item No.	Description	Unit	Unit Cost	Overall Quantity	Overall Cost
1	Mobilization	LS	$8,000.00	1	$8,000.00
2	Project Temporary Traffic Control	LS	$8,000.00	1	$8,000.00
3	Clearing and Grubbing	LS	$2,000.00	1	$2,000.00
4	Unclassified Excavation Incl. Haul	CY	$100.00	120	$12,000.00
5	Crushed Surfacing Base Course	TON	$35.00	100	$3,500.00
6	Crushed Surfacing Top Course	TON	$50.00	60	$3,000.00
7	HMA Cl. 1/2-Inch PG 64-28	TON	$250.00	30	$7,500.00
8	Storm Sewer Pipe 12 In. Diam.	LF	$100.00	10	$1,000.00
9	Underdrain Pipe Infiltration Trench System 12 In. Diam.	LF	$120.00	120	$14,400.00
10	Catch Basin Type 1	EA	$1,600.00	2	$3,200.00
11	Catch Basin Type 2	EA	$3,500.00	2	$7,000.00
12	Shoring or Extra Excavation	LF	$1.00	120	$120.00
13	Landscape Restoration	FA	$3,000.00	1	$3,000.00
14	Cement Conc. Traffic Curb and Gutter	LF	$30.00	300	$9,000.00
15	Cement Conc. Sidewalk	SY	$60.00	170	$10,200.00
16	Cement Conc. Curb Ramp	EA	$2,000.00	1	$2,000.00
			Subtotal		$93,920.00
			Contingency	10%	$9,400.00
			Estimated Construction Cost		**$103,320.00**
			Design Engineering	15%	$15,500.00
			Construction Engineering	15%	$15,500.00
			Total Estimated Project Cost		**$134,320.00**

Assumptions:

1. Tie into curb, gutter, and sidewalk at 1st. Street
2. Create curb return at 3rd Street
3. 4' wide asphalt widening (0.25' HMA, 0.25' CSTC, 0.5' CSBC)
4. 5' wide sidewalk north side

Terry D. Alapeteri, PE
HLA Engineering and Land Surveying, Inc.

1/9/19
Date

City of Selah 1/8/2019

SW Radius Improvement - 3rd Street and Fremont Avenue
Engineer's Estimate

Item No.	Description	Unit	Quantity	Unit Cost	Cost
1	Mobilization	LS	1	$3,800.00	$3,800.00
2	Project Temporary Traffic Control	LS	1	$5,000.00	$5,000.00
3	Unclassified Excavation Including Haul	CY	30	$120.00	$3,600.00
4	Crushed Surfacing Base Course	TON	30	$60.00	$1,800.00
5	HMA Cl. 1/2-Inch PG 64-28	TON	20	$250.00	$5,000.00
6	Storm Drainage Improvements	LS	1	$4,000.00	$4,000.00
7	Cement Concrete Traffic Curb and Gutter	LF	80	$70.00	$5,600.00
8	Cement Concrete Sidewalk, 6-Inch Thick	SY	30	$150.00	$4,500.00
9	Cement Concrete Sidewalk Ramp	EACH	2	$2,000.00	$4,000.00
10	Permanent Striping	LS	1	$1,000.00	$1,000.00
11	Landscape Restoration	LS	1	$3,000.00	$3,000.00

Subtotal		$41,300.00
Contingency	10%	$4,100.00
Estimated Construction Cost		**$45,400.00**
Design Engineering	20%	$9,080.00
Construction Engineering	20%	$9,080.00
Right-of-Way		$12,000.00
Total Estimated Project Cost		**$75,560.00**

Estimate Prepared By Terry D. Alapeteri **Date** 1/8/19
Terry D. Alapeteri, PE
HLA Engineering and Land Surveying Inc.

City of Selah

1/8/2019

New Traffic Signal - 3rd Street and Fremont Avenue
Engineer's Estimate

Item No.	Description	Unit	Quantity	Unit Cost	Cost
1	Mobilization	LS	1	$30,000.00	$30,000.00
2	Project Temporary Traffic Control	LS	1	$20,000.00	$20,000.00
3	Unclassified Excavation Including Haul	CY	110	$60.00	$6,600.00
4	Crushed Surfacing Base Course	TON	110	$50.00	$5,500.00
5	Select Backfill	CY	60	$40.00	$2,400.00
6	HMA Cl. 1/2-Inch PG 64-28	TON	80	$200.00	$16,000.00
7	Storm Drainage Improvements	LS	1	$12,000.00	$12,000.00
8	Cement Concrete Traffic Curb and Gutter	LF	320	$40.00	$12,800.00
9	Cement Concrete Sidewalk, 6-Inch Thick	SY	110	$100.00	$11,000.00
10	Cement Concrete Sidewalk Ramp	EACH	8	$2,000.00	$16,000.00
11	Adjust Water Valve	EACH	4	$700.00	$2,800.00
12	Adjust Manhole	EACH	1	$700.00	$700.00
13	Traffic Signal System, Complete	LS	1	$316,000.00	$316,000.00
14	Permanent Signing	LS	1	$3,000.00	$3,000.00
15	Pavement Markings	LS	1	$6,000.00	$6,000.00
16	Landscape Restoration	LS	1	$10,000.00	$10,000.00

Subtotal		$470,800.00
Contingency	10%	$47,100.00
Estimated Construction Cost		**$517,900.00**
Design Engineering	15%	$77,700.00
Construction Engineering	15%	$77,700.00
Right-of-Way		$40,000.00
Total Estimated Project Cost		**$713,300.00**

Estimate Prepared By Terry D. Alapeteri **Date** 1/8/19
Terry D. Alapeteri, PE
HLA Engineering and Land Surveying Inc.

NAC
ARCHITECTURE

12/21/18

Supplemental information regarding bus routes and walking routes for Lince Kindergarten and John Cambell Elementary. This information is being provided as supporting documentation to the Class III application and traffic impact analysis that is currently under review.

Bus Routes

John Cambell Elementary is anticipated to generate up to 28 bus trips per day; 14 morning buses and 14 afternoon buses both leaving and entering the site. Buses will continue to use the same routes, both entering and departing via N. 1st St. After the school replacement project is complete, on-street diagonal bus parking will be eliminated in lieu of a dedicated bus loop that will be accessed from N. 1st St. See attached Anticipated Bus Routes.

The Lince Kindergarten is anticipated to generate up to 28 bus trips per day; 14 morning buses and 14 afternoon buses both entering and leaving the site. Buses would arrive at the site from W. Naches Ave., turning south onto S. 3rd St. and then entering the bus loop directly from S. 3rd St. Buses would then leave the site following the same route. See attached Anticipated Bus Routes.

Walking Routes

Walking routes to and from John Cambell Elementary will continue to use the same "safe routes" that have been established by the school district. See attached Walk Route map.

Due to the age of students attending Lince Kindergarten, the majority will either be bused or will be dropped off and picked up by parents. The limited number of students that will walk with parents will utilize existing "safe routes" that have been established by the school district. See attached Walk Route map.

1203 West Riverside Avenue, Spokane, WA 99201-1107
509 838 8240 / nacarchitecture.com
Seattle / Spokane / Los Angeles

Anticipated Bus Routes

Lince Kindergarten
John Cambell Elementary

12/21/18

LINCE KINDERGARTEN
CRITICAL AQUIFER RECHARGE AREA
HYDROGEOLOGIC REPORT

Selah, Washington

Prepared for: Selah School District No. 119

Project No. 180665 • January 3, 2019 FINAL

Aspect CONSULTING

earth + water

LINCE KINDERGARTEN
CRITICAL AQUIFER RECHARGE AREA HYDROGEOLOGICAL REPORT

Selah, Washington

Prepared for: Selah School District No. 119

Project No. 180665 • January 3, 2019 FINAL

Aspect Consulting, LLC

1/3/19

Jason Michael Shira

Jason M. Shira, LHG, RG
Project Hydrogeologist
jshira@aspectconsulting.com

Tyson D. Carlson, LHG
Associate Hydrogeologist
tcarlson@aspectconsulting.com

V:\180665 Lince Kindergarten\Deliverables\Draft Hydrological Report\Lince Hydrogeological Report_Final.docx

Contents

List of Tables

List of Figures

List of Appendices

Executive Summary

Aspect Consulting, LLC (Aspect) prepared this Critical Aquifer Recharge Area (CARA) Hydrogeological Report for Selah School District No. 119 (Selah), who intends to construct the Lince Kindergarten Campus at the Robert Lince Early Learning Center (Project) in Selah, Washington (Figure 1).

The Project lies within the 10-, 5-, 1-year, and 6-month time of travel (TOT) zone for the City of Selah Water System Well Nos. 3, 4, and 8 (Wixson Wellfield) as established by the Washington State Department of Health (DOH). As a result, the City of Selah (City) is requiring completion of a CARA hydrogeological study under Chapter 11.50.110 of the Selah Municipal Code (SMC) because the proposed Project will be constructed within the wellhead protection area for an existing public water source. The purpose of this study is to evaluate the potential for the proposed Project to degrade or deplete the groundwater resource.

Approximately 2.4 acres of the proposed Project lies within the wellhead protection area of the City's Wixson Wellfield. The next nearest public supply well is located about 1,400 feet to the northwest (City's Well No. 6). No other public water supply wells are present in the vicinity.

Two principal aquifers were identified in the Project vicinity: the Upper Undifferentiated Ellensburg (Ellensburg) aquifer and the underlying Saddle Mountain Basalt aquifer. The City's Wixson Wellfield withdraws water from the Ellensburg aquifer. The Ellensburg aquifer is semi-confined with water bearing zones occurring approximately 300 to 650 feet below ground surface (bgs) near the Project. Groundwater generally flows from northwest to southeast. The Project is located cross-gradient from the Wixson Wellfield.

Key Conclusions of this report are:

- The Ellensburg aquifer near the Project site does not meet the criteria for a CARA as defined by WAC 365-190-030(3) because the land surface around the site does not provide a critical recharging effect to the aquifer, which primarily receives recharge upgradient from the Mount Clemans and Naches-Wenas highlands area.
- The susceptibility of the Ellensburg aquifer to surface contamination is locally considered to be low based on site-specific conditions. Water infiltrating from ground surface at the Project will encounter permeable layers of recent alluvial water table aquifer, which overlies the Ellensburg aquifer. As a result, much of the water infiltrating at the Project will flow in an easterly direction away from the City's Wixson Wellfield. Further limiting the potential for contamination to the well are a greater than 200-foot-thick confining layer (mudstone) between the recent alluvium and water bearing zones of the Ellensburg aquifer, and an upward vertical gradient between the Ellensburg and alluvial aquifer.
- Any potential long- or short-term risk to the aquifers from surface contamination will be mitigated through proper application of best management practices consistent with the Washington State Department of Ecology's (Ecology) Stormwater Manual and recommendations in this report (Sections 5 and 6).

1 Introduction

Aspect Consulting, LLC (Aspect) prepared this Critical Aquifer Recharge Area (CARA) Hydrogeological Report for Selah School District No. 119 (Selah), who intends to construct the Lince Kindergarten Campus at the Robert Lince Early Learning Center (Project) in Selah, Washington (Figure 1). The purpose of this study is to evaluate the potential for the proposed Project to degrade or deplete the groundwater resource.

The proposed Project will be located within Selah City limits on land that is currently paved parking and irrigated playground associated with Robert Lince Early Learning Center. The proposed construction will cover approximately 6 acres of the 13.5-acre Yakima County Tax Parcel 181435-44456 (Site).

The City of Selah (City) is requiring completion of a CARA hydrogeological study pursuant to Chapter 11.50.110 of the Selah Municipal Code (SMC) because about 2.4 acres of the western portion of the development is proposed to be constructed within the wellhead protection area for an existing public water source.

The City of Selah Group A Public Water System, No. 77400 (referred to as the Selah Water System) Wixson Wellfield is located approximately 265 feet (Well No. 4) to 345 feet (Well No. 3) southwest of the southwestern portion of the proposed Project (Figure 1). The next nearest well is a water supply well operated by the City (Well No. 6, Ecology Well ID 334196) and located about 1,400 feet northwest (upgradient) of the Project.

In evaluating aquifer susceptibility to potential contamination resulting from the proposed development, this study determines whether the aquifer meets the definition of a CARA under WAC 365-190-030(3):

> *"Critical aquifer recharge areas" are areas with a critical recharging effect on aquifers used for potable water, including areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water, or is susceptible to reduced recharge.*

Presented herein are discussions of the proposed construction, geology, and hydrogeology near the proposed development, and susceptibility of the local aquifer(s). This discussion is followed by recommendations to mitigate potential impacts to the aquifer through Best Management Practices (BMP) that can be implemented to design, construct, and maintain the Project to satisfy the dual priorities of protecting local aquifers and developing the Project.

This report was prepared to meet the City's Critical Aquifer Recharge Areas Ordinance for a hydrogeological assessment. This report satisfies requirements for hydrogeological reports presented in SMC 11.50.080(c) *Critical Areas Report*, 11.50.080(d) *Mitigation Requirements*, and 11.50.110(c) *Critical Aquifer Recharge Area Performance Standards.*

1.1 Proposed Project Summary

The proposed Project will consist of a new kindergarten campus for Selah. The Project is scheduled to start Spring 2019 and conclude in the summer 2020. The new facility, which is designed to accommodate 360 students, will be constructed at the existing Lince campus. The 48,164 square foot school will be built to support the varying educational needs of kindergarten learners. The facility will be comprised of age appropriate indoor and outdoor learning environments with 20 classrooms. There will be locations for special needs and programs including indoor active learning rooms, an art room, resource classroom, OT/PT room, library, music room, fitness area/cafeteria and other spaces typical of an elementary school. The campus will have associated peripheral exterior concrete slabs, asphalt parking and driveway access to the adjacent 3rd Street and Naches Avenue, and facilities for stormwater management.

2 Methods of Investigation

Aspect reviewed existing data and reports to form an understanding of the surface and groundwater conditions the Project area. Information related to well logs, water systems, geology, and water quality where obtained from the Washington Department of Ecology (Ecology) online water well report database, the Washington Department of Health SENTRY database and Source Water Assessment Program (SWAP), the Washington State Geologic Survey Geologic Information Portal, City of Selah Wellhead Protection Plan, and the City of Selah 2014 Water System Plan (HLA 2014). No new information was collected, and a site visit was not performed for this CARA study.

2.1 Wells in the Project Vicinity

The Ecology online water well database was queried to search for water supply wells within 0.5 mile of the Project Site. These well reports are included in Appendix A. The well reports were used to support development of a conceptual hydrogeologic framework and evaluation of aquifer conditions and susceptibility.

Locations of wells within 0.5 mile are shown on Figure 1 and well characteristics are provided in Table 1. Locations for three wells operated by the City—Well Nos. 3, 4 and 8—were confirmed using the Washington State Department of Health (DOH) Source Water Assessment Program (SWAP) online map and City of Selah 2014 Water System Plan (HLA 2014). These wells are located approximately 365, 285, and 245 feet southwest of the Project, respectively. The City's Well Nos. 3, 4, and 8 are collectively referred to as the Wixson Wellfield in this report and are the subject wells triggering the CARA study under the SMC.

Two additional City water system supply wells (Well Nos. 5 and 6) were located using SWAP and HLA 2014 and are located approximately 1,825 and 1,380 feet east and northwest, respectively, of the Project. No domestic water supply wells were identified within a 0.5-mile radius of the Project.

The Wixson Wellfield wells were drilled between 1944 and 2010 using cable tool and air rotary methods. The wells are completed in the Ellensburg aquifer and are open to water bearing zones between 200 and 656 feet below ground surface (bgs). Information regarding the surface, or formation, seal for Well Nos. 3 and 4 is not available; however, cable tool drilling method often requires driving casing. Driving the casing through clayey deposits (typical with Ellensburg Formation) can form a seal between the surface and open well intervals. Well No. 8 has a bentonite and neat cement seal from land surface to approximately 264 feet bgs. The driller's log incorrectly states the seal extends to 304 feet bgs.

Well Nos. 3 and 4 have a current yield of 400 gpm; whereas, Well No. 8 has a yield of 1,100 gpm (HLA 2014). Water produced from the City's wells do not require treatment aside from chlorination prior to entering the City's distribution system (HLA 2014).

2.2 Water Systems and Surface Water in the Project Vicinity

Public drinking water supply systems are regulated under the Safe Drinking Water Act (SDWA). DOH regulates Group A systems (15 or more connections). Under the SDWA, wellhead protection areas are defined and the susceptibility of wells to contamination is rated. These zones are based on estimated times of travel of contaminants to the well. The SMC 11.50.110 designates the areas within a 10-year TOT zone of a public supply well as potential CARAs.

Locations and information on nearby public water systems were obtained by reviewing the SWAP online map. Figure 1 illustrates the location of the Project relative to the Wixson Wellfield wellhead protection areas. The western portion of the Project lies within less than:

- 2.4 acres of the 10-year TOT
- 1.5 acres of the 5-year TOT
- 0.9 acres of the 1-year TOT
- 0.5 acres of the 6-month TOT of the Wixson Wellfield

The City's Well No. 6 lies about 1,385 feet to the northwest of the Project. This well is hydraulically upgradient of the Project site (see Section 4.2, Groundwater Flow).

As stated in the previous section, there are no domestic supply wells within 0.5-mile radius of the Project. The surrounding residential and commercial buildings receive water from the Selah Water System.

DOH has rated the Wixson Wellfield as having high susceptibility to contamination; whereas, the City's Wellhead Protection Plan (WHPP) rates the susceptibility of the Wixson Wellfield as moderate. The WHPP lists 8 sources of contamination within the 10-year TOT.

Chapter 11.50.080(c) of the SMC requires identification of all critical area, wetland, water bodies and buffers adjacent to the Project area. No critical areas were identified adjacent to the Project area, aside from the Wixson Wellfield wellhead protection area.

3 Geology

The Project is located on the west-central margin of the Columbia River Plateau, a structural province formed by a series of continental basalt flows collectively known as the Columbia River Basalt Group (CRBG). The Columbia Plateau includes most of the Columbia River Basin and has been divided into three physiographic regions known as the Yakima Fold Thrust Belt (YFTB), Palouse Slope, and Blue Mountains sub-provinces (Kahle et al 2011). The Project is located near the western portion of the YFTB sub-province. The following sections provide details of the geologic structure and stratigraphy and groundwater occurrence within this area. Figure 2 shows the surficial geology of the area.

Local geologic characteristics are largely the result of regional tectonic processes. The City of Selah is located within the Selah Basin of the YFTB. The Project is on the north side of the east-west trending Yakima Ridge anticline, and south of the Selah syncline.

Regional bedrock is dominated by the Columbia River Basalt Group (CRBG), a series of stacked basalt flows and sedimentary interbeds that were deposited 17 and 6 million years ago during the Miocene epoch. The CRBG is underlain, intercalated, and overlain by volcanoclastic sedimentary deposit (Ellensburg Formation) derived from ancestral cascade volcanoes. The Ellensburg Formation is overlain by ancestral Yakima River deposits known as Thorp Gravel, and recent alluvial deposits.

3.1 Site Hydrostratigraphic Units

Hydrogeology of the area is dominated by four principal geologic units. Characteristics and distribution of each unit is described as follows:

- **Alluvial Terrace Deposits** - Surface sediments are dominated by quaternary unconsolidated or semiconsolidated alluvial terrace deposits. The deposits are composed of clay, silt, sand, gravel, and/or cobble sized grains deposited by fluvial processes associated with the Yakima River.

- **Thorp Gravel** – This older, Yakima River Valley filling sequence consists of weakly cemented clay and cobble to gravel conglomerate with siltstone and sandstone interbeds that was deposited in the Selah Basin after the Ellensburg Formation. The Thorp Gravel is generally described as "cemented sand and gravel" and "black", "red", and/or "multicolored" in regional well logs and is assumed to be lower-permeability with respect to overlying alluvium. Local thickness of the Thorp Gravel is less than 200 feet (Jones et al 2006). The Thorp Gravel is generally considered to be in hydraulic continuity with the Yakima River.

- **Upper Undifferentiated Ellensburg Formation** - The Upper Undifferentiated Ellensburg (Ellensburg) Formation is largely the result of deposition of volcanoclastic sediment from nearby domal volcanoes. The deposits are composed of intercalated conglomerates, sandstones, and siltstones. These sediments often occur as stratigraphic sequences alternating between laterally extensive depositional sheets

of hyperconcentrated flood flow deposits to reworked sediments that are moderately sorted, bedded and crossbedded (Waitt, 1979).

The sedimentary aquifer consists mostly of semiconsolidated clay, silt, and sand with some gravel and conglomerate. Thickness of individual beds within the aquifer range from a few feet to more than 100 feet. Strata of clay, silt, and fine sand usually are somewhat thicker than strata of the coarser materials. Total thickness is approximately 400 to 600 feet in the Project area. The Ellensburg Formation is commonly used for water supply with relative high yields.

The stratification of fine-grained, indurated, sediments of the Ellensburg Formation create a semi-confining aquifer condition. In addition, review of static water levels for Well Nos. 3, 4, and 8, which are completed at different depths, indicates an upward vertical gradient.

The subject Wixson wellfeild is completed in the water bearing zone of the Ellensburg Formation.

- **Saddle Mountains Basalt** – The CRBG is the basement bedrock unit and defined by the Pomona Member of the Saddle Mountains Basalt Formation unit in the area. This unit is underlain by the differentiated Ellensburg Formation sedimentary interbed known as the Selah Interbed. Groundwater in the CRBG aquifer system ultimately discharges laterally out of the Selah Basin into the Yakima River Valley near Selah Gap. In addition, vertical hydraulic gradients within the basalt aquifer indicate potential for upward vertical leakage of groundwater into the overlying aquifers.

Based on review of well logs, the City's existing wells are completed in either the Upper Ellensburg (e.g. Wixson Wellfield) or Saddle Mountains Basalt Formation (e.g. Well No. 6).

4 Hydrogeology

4.1 Groundwater Occurrence

Principal aquifers in the Project area include water-bearing intervals of the Ellensburg and Saddle Mountains Basalt formations. All water supply wells within 0.5 mile of the Project appear to be completed in these two aquifers. Water-bearing zones typically occur within primary porosity of weakly cemented gravels, bedding planes, fractured fine-grained indurated sedimentary beds, vesicular basalt flow tops, fracture basalt, and interflow zones of the basalts, with much of the thickness of the unfractured fine-grain sedimentary and basalt units between water bearing zones acting as an aquitard or barrier to groundwater movement. The Ellensburg aquifer is largely semi-confined, and the Saddle Mountains Basalt aquifer is largely confined. Both the Ellensburg and Saddle Mountains Basalt aquifers are viable aquifers for water supply and are the main water source for the City and surrounding commercial and residential users.

Where present, overlying alluvium and Thorp Gravel may host a surficial water table aquifer. This thin surficial water table aquifer in the Project area does not present a viable aquifer for water supply. However, this water table aquifer is likely in direct hydraulic continuity with surface water and is important for ecological health.

4.2 Groundwater Flow

Groundwater flow in the water table, Ellensburg, and Saddle Mountains Basalt aquifers is described by Vaccaro et al 2009. In general, the aquifers mimic land surface topography toward the Yakima River and down the Yakima River Valley. Figure 2 depicts the direction of groundwater flow. Groundwater flow within the water table aquifer occurs between grains of unconsolidated rocks with recharge occurring from water distribution line leakage, irrigation return flow, and precipitation in the immediate area. Groundwater flow direction of the water table aquifer is largely controlled by the topography of the underlying Ellensburg Formation, which forms a low permeability (i.e. low hydraulic conductivity) unit restricting downward flow of groundwater. Groundwater flow within the Ellensburg occurs between the interstitial space of sedimentary grains, bedding planes, and fractures. Recharge of the Ellensburg aquifer likely occurs at higher elevation (Naches-Wenas highlands) and along contacts of the CRBG and Ellensburg Formation. Groundwater flow occurs in a semi-confined space and is likely both structurally and hydraulically driven from areas of high pressure to low pressure. Similarly, the Saddle Mountains Basalt aquifer received recharge along contacts between successive basalt flows likely in the area of Mount Clemens and along Umtanum Ridge, and groundwater flow occurs in a semi-confined to confined space primarily driven by hydraulic head and structurally controlled.

The hydrogeologic conceptual model of groundwater flow is that the water table aquifer mimic topography; whereas, groundwater flow in the Ellensburg and Saddle Mountains Basalt aquifers are controlled by geologic structures (e.g. folds and faults). For example, recharge of the Ellensburg aquifer occurs in the Naches-Wenas highlands, which provides the high hydraulic head. Near the Project, the groundwater flow pathway is

toward Selah Gap and semi-confined. The semi-confined condition is created due to the large difference in vertical and horizontal hydraulic conductivity. Near Selah Gap folding and faulting of the CRBG forms a hydraulic barrier, forcing groundwater to discharge into the Yakima River. Figure 3 below illustrates the various groundwater conditions.

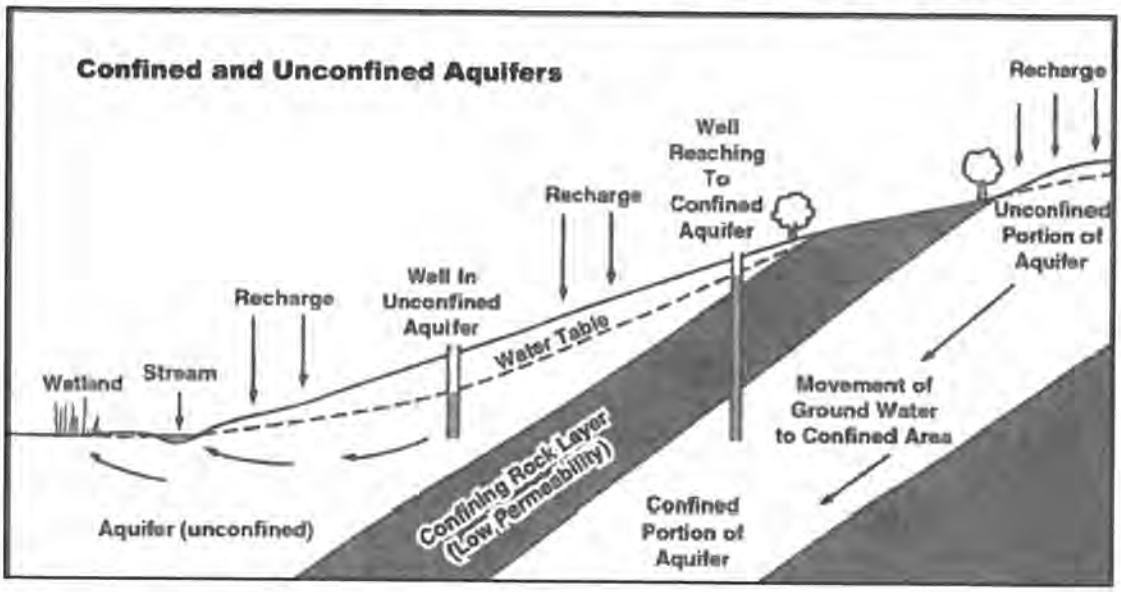


Figure 3. Groundwater Conditions

4.3 Groundwater Quantity

The proposed Project involves construction of buildings and newly paved surfaces resulting in a net increase in impervious surface. The Project includes stormwater appurtenances to convey runoff toward onsite bio-infiltration swales and drywells retention and infiltration of stormwater away from the wellhead protection area. The loss in grass cover and increase in impervious surface may result in a net gain (due to decreased evapotranspiration) of precipitation infiltrating the subsurface to the water table aquifer. However, the Project will result in no change in recharge to the Ellensburg aquifer due to the thick confining unit, and upward vertical gradient, between the water table aquifer and the Ellensburg aquifer.

The net impact of the Project on water quantity to the Ellensburg and Saddle Mountains Basalt will be *de minimis*.

4.4 Groundwater Quality

Runoff from parking lot and roofs can be contaminated with pollutants from vehicles including oil and grease, polycyclic aromatic hydrocarbons (PAHs), lead, zinc, copper, cadmium, sediments (soil particles), and road salts and other deicers. Additionally, landscaping activities associated with the Project can contribute pollutants to runoff including herbicides, pesticides, and nutrients (from fertilizers). The Project as proposed will manage sewage through connection to the City's sewer system.

In a remote worst-case scenario, contaminants in larger quantities could be released onto the roadway in the event of a vehicle accident, for example. If left untreated, these

contaminants could impair receiving surface and groundwater bodies when they are dissolved into the water column or otherwise transported to a receiving water body.

Local background water quality data at the Project site is limited to regular reporting of source water quality sampling by the Selah Water System. DOH requires the Selah Water System to monitor inorganic chemicals, nitrate/nitrite, volatile organic chemicals, synthetic organic chemicals, gross alpha, and radium 228. Results of water quality monitoring indicate zero exceedances for all monitored parameters.

4.4.1 Aquifer Susceptibility

The susceptibility of an aquifer to pollution from contaminants originating at the ground surface depends on the characteristics of the contaminant and properties of the vadose zone forming the unsaturated area between the ground surface and the underlying water table. DOH's SWAP database rates the susceptibility of the Wixson Wellfield as high (DOH, 2018); whereas, the Selah Wellhead Protection Plan rates the susceptibility as moderate.

The water bearing zones in the Ellensburg aquifer are about 200 to 300 feet bgs and the aquifer is overlain by an aquitard 100 to 200-feet thick comprised of clayey and mudstone units. The hydraulic conductivity of the aquitard is likely controlled by the fine-grained matrix, which also presents a high degree of adsorption of contaminants as they migrate through the soil column. The presence of the thick aquitard provides a natural measure of protection to the underlying Ellensburg aquifer by retarding vertical migration of contaminants from the surface. The Ellensburg aquifer and source for the Wixson Wellfield therefore is considered to have a low susceptibility to contamination based on site-specific conditions. The higher ranking in the SWAP database and Selah Wellhead Protection Plan may be due to the inventory of existing and potential sources of groundwater contamination within the wellhead protection area.

The following section outlines recommendations for mitigation of potential contamination to the water table and semi-confined to confined aquifers.

5 Mitigation: BMPs to Protect Groundwater and Promote Recharge

The previous section establishes local aquifer susceptibility from the Project as low. However, Chapter 11.50.080(d) of the SMC requires the applicant to avoid material impacts that degrade the function and values of critical areas, and that mitigation occur onsite, when possible, and sufficiently and reasonably maintain the functions and values of the critical area.

This section provides recommendations to mitigate potential long-term cumulative and short-term worst-case impacts to the aquifer consistent with the SMC. Mitigation recommendations were selected to address the potential for negative impacts to groundwater quality resulting from the proposed development under two scenarios: impacts of routine day-to-day use of the roadway and a worst-case scenario involving a spill or release of contaminants along the roadway.

Recommended mitigation includes implementation of Best Management Practices (BMPs). The primary purpose of BMPs are to protect water resources through prevention of contamination, reduction of pollutant concentrations and loads, and/or management of discharge flow rates. Section 3 of the *Critical Aquifer Recharge Area Guidance* provides recommendations on protection of the functions and values of critical aquifer recharge areas (Ecology, 2005). Step 8 of Section 3 of that document provides recommendations related to recharge within critical aquifer areas, including preference for low impact development techniques to promote recharge.

Low-impact development techniques include surficial infiltration managed as close to the source as possible in order to mimic natural hydrologic conditions. Implementing surficial infiltration BMPs that are appropriately engineered consistent with Ecology's *Stormwater Management for Eastern Washington* (Stormwater Manual; Ecology, 2004) should allow for adherence to both Ecology's critical aquifer recharge guidance and section 11.50.110(c) of the SMC, which allow for uses which do not significantly diminish aquifer recharge.

5.1 Engineering Controls

5.1.1 Construction Stormwater BMP

Stormwater runoff from construction-related activities should be managed in accordance with Ecology and National Pollution Discharge Elimination System (NPDES) standards, including development of a Stormwater Pollution Prevention Plan (SWPPP) and implementation of adequate construction stormwater temporary erosion and sediment control BMPs. Construction-related BMPs fall into two main categories: Source Control and Runoff Quantity/Treatment.

Source control BMPs include the preservation of natural vegetation, maintaining buffer zones, high visibility fencing, stake and wire fencing, and stabilizing construction entrances. Temporary runoff conveyance and treatment BMPs include inlet protections,

silt fence, interceptor dikes, ditches and swales, grass lined channels, pipe slope drains, level spreaders, silt dikes, straw wattles, sediment traps, and outlet protections.

Selection of adequate temporary source control and runoff conveyance/treatment BMPs should be made by a qualified designer/engineer and adopted by the site operator in conjunction with the Certified Erosion and Sediment Control Lead (CESCL).

5.1.2 Preservation of Natural Drainage, Water Quality Treatment and Flow Control

Natural drainage patterns should be maintained to the extent practical, consistent with Section 2.2.4 of the Stormwater Manual. Natural drainage patterns likely consist of a combination of surface water flow and infiltration. Existing drainage patterns should be established through topographic analysis in conjunction with consideration of soil types and existing landcover. Drainage should be concentrated outside of the 10-year TOT zone.

Stormwater runoff from new impervious pollution-generating surfaces (e.g., pavement and rooftops) should be captured in stormwater treatment and flow-control BMPs to limit surface runoff quantities to pre-existing conditions consistent with hydraulic analyses performed in accordance with the Stormwater Manual; Chapter 4 and flow management criteria of Section 2.2.6. Low impact, infiltration-related BMPs should be evaluated for use in conjunction with the design, provided they can be engineered to prevent degradation of groundwater quality (post-treatment) consistent with CARA Guidance. Examples of minimum basic stormwater treatment and flow control BMPs that may be acceptable for use at this site include the following:

- BMP T5.10 Infiltration ponds
- BMP T5.20 Infiltration trenches
- BMP T5.21 Infiltration swales
- BMP T5.30 Bio-infiltration swales

Based on Section 5.4.2 of the Stormwater Manual, these facilities are capable of removal and reduction of target pollutants to levels that will not adversely affect public health or beneficial uses of surface and groundwater resources, and will not cause a violation of groundwater quality standards (when properly engineered). It is important to note that recommended practice when utilizing infiltration facilities includes pretreatment to reduce the occurrence of plugging. Should the local jurisdiction determine that either phosphorus or metals removal is required, additional treatment BMP may be necessary.

5.1.3 Spill Response Actions

In an unlikely worst-case scenario, a release could occur on the kindergarten campus. Cleanup of spills would commence immediately after the release initiated by the operator of the vehicle (if commercial) or local fire department and hazardous response teams to contain the release within the paved roadway using spill containment booms and absorbent materials.

Should a release reach a storm drain before the drain could be protected, contaminants could reach the stormwater facility (and potentially the subsurface). In this case, after addressing surface occurrences of spilled products as described above, spill response would include evaluating the potential for free product transport to the subsurface. Releases of free product to the subsurface would be addressed as described in the *Remediation* section below.

5.2 Remediation of Potential Subsurface Releases

If liquid products are released to the subsurface, a number of actions can be taken to prevent migration of the products to the underlying aquifer. The extent of the release would be characterized using standard subsurface exploration techniques (such as drilling and soil sampling), and releases to soil could be mitigated using one or more of the following technologies:

- **Excavation.** Shallow contaminated soil may be excavated and disposed of off-site (e.g., at an appropriate landfill). Given the physical characteristics (relatively viscous liquids) and maximum on-site quantities of most products, products expected to be used on, or transported to, the site are not likely to result in extensive subsurface impacts should they be released to the environment. It is expected that excavation will be suitable to address most potential subsurface releases.
- **Soil Vapor Extraction.** Removal of volatile compounds such as methanol may also be addressed *in situ* using soil vapor extraction. In this technology, volatile products are removed from the subsurface by applying a vacuum to the underlying soil and extracting and treating the soil vapor.

Given the potential for a thin unsaturated zones above the shallowest water-bearing zone at the Project site, any release should be addressed immediately to avoid reaching groundwater. However, in the event a release reaches groundwater, contamination could be contained on-site and treated with a number of commonly-applied remedial technologies, including:

- **Bioremediation.** The products that will be used at the Site are highly biodegradable by native bacteria present in soil and groundwater. Natural removal of products from the subsurface can also be enhanced by adding constituents, such as oxygen, that encourage microbial growth.
- **Air Sparging**. This technology involves removing volatile compounds from groundwater by injecting air into groundwater wells. The vapors are typically collected with a coupled soil vapor extraction system.

6 Conclusions and Recommendations

6.1 Conclusions

Approximately 2.4 acres of the proposed Project lie within the City's wellhead protection area of the Wixson Wellfield, capturing water from a depth of at least 200 feet bgs in the Ellensburg aquifer.

The Ellensburg aquifer near the Project site does not meet the criteria for a CARA as defined by WAC 365-190-030(3) because the land surface around the site does not provide a critical recharging effect to the aquifer, which is primarily recharged upgradient from the Project.

The susceptibility of the Ellensburg aquifer to surface contamination is locally considered to be low. Water infiltrating from ground surface at the Project will encounter low permeability layers (100 to 200-feet-thick) within the Upper Ellensburg Formation that overlies the water bearing zones of the Ellensburg aquifer. As a result, much of the water infiltrating at the Project will flow easterly away from the Wixson Wellfield, located cross-gradient. An upward vertical gradient further limits potential for contamination to the well.

Any potential long- or short-term risk to the aquifer from surface contamination will be mitigated by proper application of BMPs consistent with the Stormwater Manual and recommendations in this report.

6.2 Recommendation

We recommend the following:

- Engineering for the proposed project should include a stormwater site plan incorporating runoff, flow control, and treatment BMPs consistent with the Stormwater Management manual for Eastern Washington and as outlined in Section 5 of this report.

7 References

Huibregtse, Louman Associates, Inc (HLA), 2014, City of Selah Water System Plan. Project No. 13046, October 2014.

Jones, M.A., Vaccaro, J.J., and Watkins, A.M., 2006, Hydrogeologic framework of sedimentary deposits in six structural basins, Yakima River Basin, Washington: U.S. Geological Survey Scientific Investigations Report 2006-5116, 24 p.

Kahle, S.C., Morgan, D.S., Welch, W.B., Ely, D.M., Hinkle, S.R., Vaccaro, J.J., and Orzol, L.L., 2011, Hydrogeologic framework and hydrologic budget components of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho: U.S. Geological Survey Scientific Investigations Report 2011–5124, 66 p.

Vaccaro, J.J., Jones, M.A., Ely, D.M., Keys, M.E., Olsen, T.D., Welch, W.B., and Cox, S.E., 2009, Hydrogeologic framework of the Yakima River basin aquifer system, Washington: U.S. Geological Survey Scientific Investigations Report 2009–5152, 106 p.

Waitt, Richard B, Jr., 1979, Late Cenozoic Deposits, Landforms, Stratigraphy, and Tectonism in Kittitas Valley, Washington. Geological Survey Professional Paper 1127.

Washington State Department of Ecology (Ecology), 2004, Stormwater Management Manual for Eastern Washington, Publication No. 04-10-076, September 2004.

Washington State Department of Ecology (Ecology), 2005, Critical Aquifer Recharge Areas Guidance Document, Publication No. 05-10-028, January 2005.

Washington State Department of Health (DOH), 2018, Office of Drinking Water SWAP Source Water Assessment Program database and map, available at: https://fortress.wa.gov/doh/eh/dw/swap/maps/.

8 Limitations

Work for this project was performed for Selah School District No. 119 (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

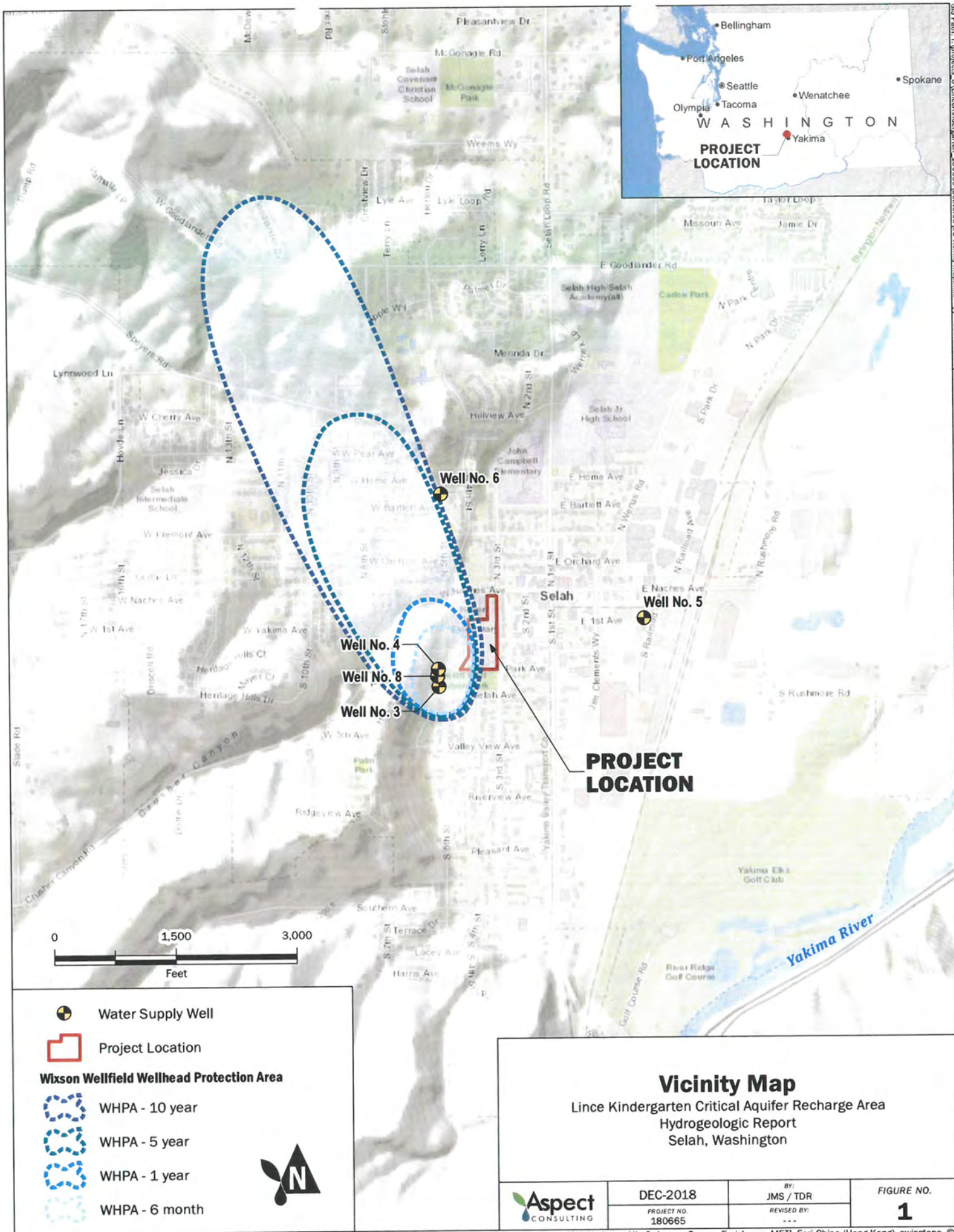
TABLES

Table 1. Neighboring Water Supply Well Summary

180665, Lince - Kindergarten, Selah, WA

Owner	Ecology Well Tag No.	Well Surface Diameter (inches)	Well Depth (feet)	First Open Interval (feet bgs)	Construction Completed	Source Aquifer	Notes
City of Selah (Well No. 3)	--	16	431	322	Dec-44	Upper Ellensburg	Wixson Wellfield
City of Selah (Well No. 4)	--	10	292	200	Jan-47	Upper Ellensburg	Wixson Wellfield
City of Selah (Well No. 5)	--	24	578	200	Aug-51	Upper Ellensburg	
City of Selah (Well No. 6)	--	20	966	86	Feb-60	Saddle Mountain Basalt	
City of Selah (Well No. 8)	AAS171	16	670	297	Apr-10	Upper Ellensburg	Wixson Wellfield

FIGURES

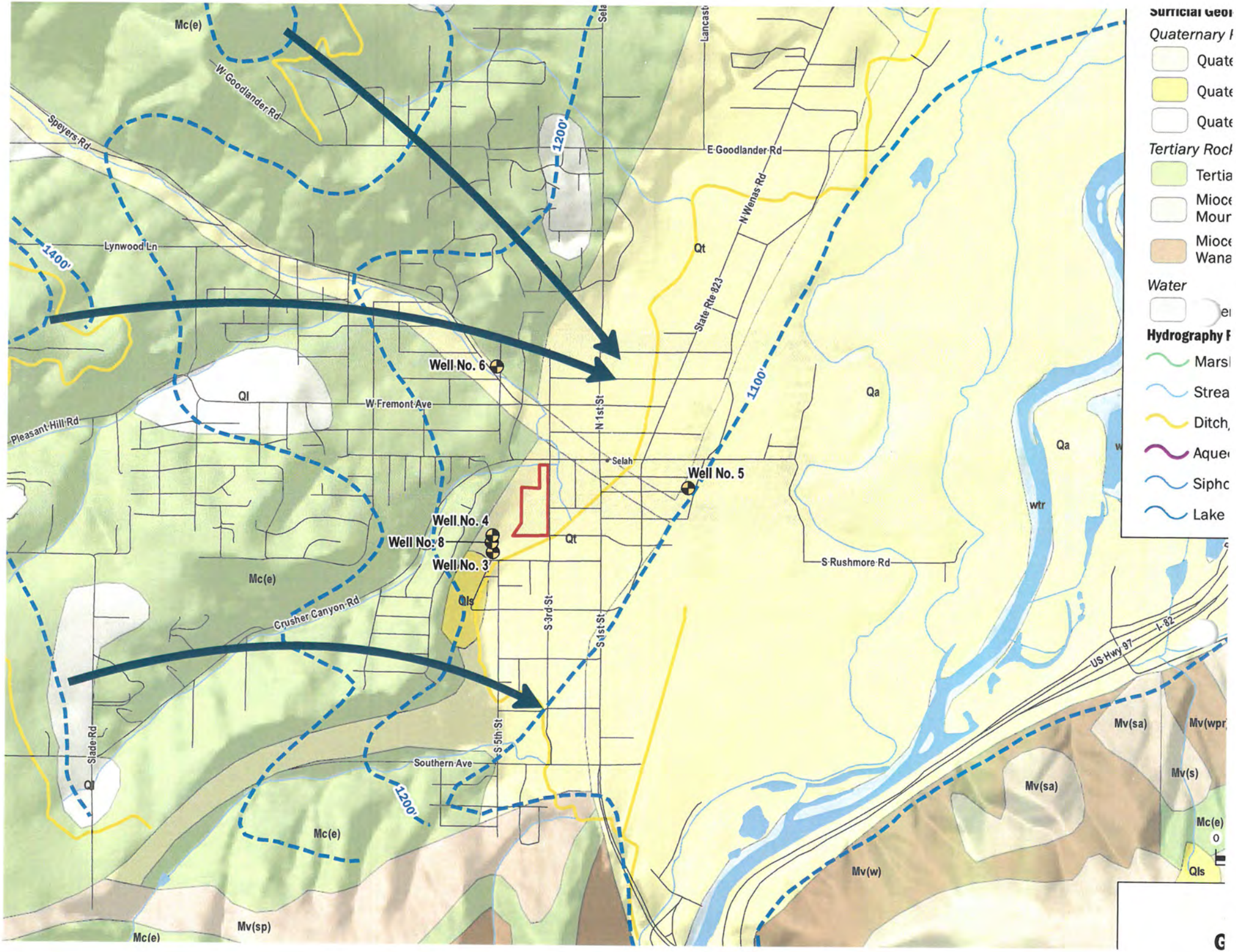


Vicinity Map

Lince Kindergarten Critical Aquifer Recharge Area
Hydrogeologic Report
Selah, Washington

Aspect Consulting	DEC-2018	BY: JMS / TDR	FIGURE NO. 1
	PROJECT NO. 180665	REVISED BY: ---	

GIS Path: T:\projects_8\Lince Kindergarten_180665\Delivered\01 Vicinity Map.mxd || Coordinate System: NAD 1983 StatePlane Washington South FIPS 4602 Feet || Date Saved: 12/18/2018 || User: trullen || Print Date: 12/18/2018


Mc(e)
W Goodlander Rd
Speyers Rd
1200'
E Goodlander Rd
N Wenas Rd
Lynwood Ln
1400'
Qt
State Rte 823
1100'
Well No. 6
Ql
W Fremont Ave
N 1st St
Qa
Pleasant Hill Rd
Selah
Well No. 5
Qa
wtr
Well No. 4
Well No. 8
Well No. 3
Qt
S Rushmore Rd
Mc(e)
Qls
S 3rd St
S 1st St
Crusher Canyon Rd
I-82
US Hwy 97
Mv(sa)
Mv(wpr)
Mv(s)
Slade Rd
S 5th St
Southern Ave
Ql
1200'
Mc(e)
Mv(sa)
Mc(e)
Mv(w)
Qls
Mv(sp)
Mc(e)
Surficial Geol
Quaternary
Quate
Quate
Quate
Tertiary Rock
Tertia
Mioce
Mour
Mioce
Wana
Water
Hydrography
Marsh
Strea
Ditch
Aque
Siphc
Lake