



Whipple Consulting Engineers, Inc.

WCE No. 14-1166

October 15, 2015

City of Spokane Valley
11707 E Sprague Avenue Suite 106
Spokane Valley WA 99206

Attn: Gabe Gallinger, P.E.
Sean Messner, P.E.

Re Painted Hills Traffic Impact Analysis – Response to Traffic Count Comments PM peak hour recounts, week of October 5th, 2015.

Dear Sean

In your letter dated October 2, 2015, you noted that certain traffic counts were invalid, due to their proximity to federal holidays and additionally that it snowed within the region, but not necessarily at the intersections or within the Spokane Valley. It has been our experience that aside from the holiday season Thanksgiving to New Year's, there is little addition to traffic volumes from holidays.

Per your comments, on October 6th, 7th, & 8th we recounted all of the intersections in the PM peak Hour and most of the AM peak hour. We propose to collect the remaining two AM intersections on Tuesday October 20th.

In general these October counts are 5% to 10% higher than the January and July traffic counts. A copy of the PM Peak hour traffic counts are attached to this letter.

From these updated traffic counts we updated the Level of service calculations for the PM Peak hour and have provided the study level of service tables with a comparison column. As shown on the provided tables. The October counts have changed some of the levels of service within the acceptable range. Except for the intersection of 16th Avenue & Pines Road which falls to a Level of service F, earlier than we anticipated. It is our opinion that the only way to return this intersection to an acceptable level of service would be to remove the southbound slip lane and redirect trips to the signal at 16th Avenue & SR 27. Thereby removing them from the 16th Avenue & Pines Road, a closely spaced intersection.

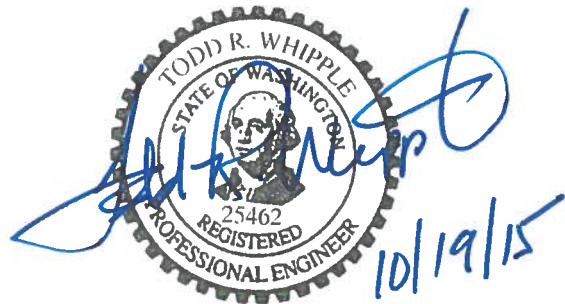
The PM peak hour calculations are attached to this letter. With the completion of the AM peak hour counts next week we hope to repeat this process and this letter.

With the provided traffic count data and level of service calculations we do not see any reason why you cannot complete your review of Painted hills Traffic Impact Analysis, considering the noted change.

In speaking with City staff during your leave, we noted that we would submit the updated AM peak counts under a separate cover such as this. Following your full review of the document we will submit the entire revised document for review and approval.

If you have any questions or comments in regard to this letter please feel free to contact us at (509) 893-2617.

Thank You



Todd R. Whipple, P.E.

TRW/bng

Encl: Raw PM Traffic Counts
Level of Service Tables
Level of service Calculations.

RAW TRAFFIC COUNTS

DATE OF COUNT: 10/8/2015
 Counter: BNG
 Analyst: BNG

APPROACH	MOVEMENT	15 Minute Period Beginning @													
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM		
		pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk
Eastbound	Left			1						0		1			
	Through			75		1	80		85		106		96		2
	Right			8		4	5		3		3		4		
	App. Total	0	0	84	0	80	1	86	1	88	1	110	1	100	2
Pct Trucks					0.012		0.011		0.011		0.009		0.02		
Westbound	Left			13	1	12		23		13		21		15	
	Through			37	2	40		48		35		37		56	
	Right			8	1	10		13		13		15		16	
	App. Total	0	0	58	4	62	0	84	1	61	0	73	1	87	0
Pct Trucks					0.065		0.012		0.014		0		0		
Northbound	Left			2	1	10	1	1		13		2		3	
	Through			11	1	17		10		13		21		9	
	Right			14				12		0		11		14	
	App. Total	0	0	27	2	27	1	23	1	26	0	34	0	26	0
Pct Trucks					0.069		0.036		0.042		0		0		
Southbound	Left			27	2	24	1	16		27		22		30	
	Through			22	1	20		22		24		26		32	
	Right			2				2		0		1		2	
	App. Total	0	0	51	3	45	1	40	1	51	0	49	1	64	0
Pct Trucks					0.056		0.022		0.024		0		0		
Total Intersection Volume		0	0	0	220	9	214	3	233	4	226	1	266	3	277
Intersection Pct Trucks					3.9%		1.4%		1.7%		0.4%		1.1%		0.7%

Intersection Total	Pct
One Hour Volumes	Trucks
5:00 PM	548
5:15 PM	279
5:30 PM	0

Intersection Total	Pct
One Hour Volumes	Trucks
3:30 PM	446
3:45 PM	663
4:00 PM	910
4:15 PM	950
4:30 PM	1012
4:45 PM	775

Notes:

PROJECT: Painted Hills GC
 JOB NO: 13-1166
 INTERSECTION: 32nd & University

Data Transfer
 Intersection No. 1

DATE OF COUNT: 10/8/2015
 Counter Analyst: Whipple Consulting Engineers, Inc
 JDK BNG PM PEAK HOUR BREAKDOWN

APPROACH	MOVEMENT	4:30 PM		4:45 PM		5:00 PM		5:15 PM		TOTAL	P.H.F.	Pct Trucks
		pass	lrk	pass	lrk	pass	lrk	pass	lrk			
Eastbound	Left	1		0		1		0		2	0.50	0%
	Through	80		85		106		96		371	0.87	1%
	Right	5		3		3		4		16	0.67	6%
	App. Total	86		88		110		100		389	0.88	
	Pct Trucks	0.011494		0.011236		0.009009		0.019608				
Westbound	Left	23		13		21		15		72	0.78	0%
	Through	48		35		37		56		176	0.79	0%
	Right	13		13		15		16		59	0.92	3%
	App. Total	84		61		73		87		307	0.88	
	Pct Trucks	0.011765		0		0.013514		0				
Northbound	Left	1		13		2		3		19	0.37	0%
	Through	10		13		21		9		54	0.64	2%
	Right	12		0		11		14		37	0.66	0%
	App. Total	23		26		34		26		110	0.81	
	Pct Trucks	0.041667		0		0		0				
Southbound	Left	16		27		22		30		97	0.81	2%
	Through	22		24		26		32		104	0.81	0%
	Right	2		0		1		2		5	0.63	0%
	App. Total	40		51		49		64		206	0.80	
	Pct Trucks	0.02439		0		0.02		0				
Total Intersection Volume		233		226		266		277		1012	0.91	
Intersection Pct Trucks		1.7%		0.4%		1.1%		0.7%				

Pedestrian Calls

APPROACH	MOVEMENT	4:30 PM		4:45 PM		5:00 PM		5:15 PM		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
Westbound	Through	1								1
Northbound	Through	1								1
Southbound	Through							1		1
	App. Total	2	0	0	0	0	0	1	1	3

DATE OF COUNT: 10/7/2015
 Counter Fred
 Analyst BNG
 PM PEAK HOURS

APPROACH	MOVEMENT	15 Minute Period Beginning @														Total Intersection Volume	Intersection Pct Trucks
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM				
		pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk		
Eastbound	Left					16	7	20	13	16	14	15	23	16			
	Through						7	8	13	14	14	12	11				
	Right						6	8	1	2	4	3					
	App. Total	0	0	0	0	29	21	41	22	31	20	30	38	30	0	0	
	Pct Trucks					0	0	0	0	0	0	0	0	0	0	0	
Westbound	Left					4		0		4		9	11	7			
	Through					24		15		21		27	26	29			
	Right					5		0		0		1	2	2			
	App. Total	0	0	0	0	33	0	15	0	25	0	37	39	38	0	0	
	Pct Trucks					0	0	0	0	0	0	0	0	0	0	0	
Northbound	Left					5		11		10		12	12	4			
	Through					41		26		38		49	45	41			
	Right					10		4		0		5	2	2			
	App. Total	0	0	0	0	56	0	41	0	48	0	66	59	47	0	0	
	Pct Trucks					0	0	0	0	0	0	0	0	0	0	0	
Southbound	Left					8		3		1		8	2	5			
	Through					57		73		69		68	80	78			
	Right					28		38		29		35	44	48			
	App. Total	0	0	0	0	93	0	114	0	99	0	111	126	131	0	0	
	Pct Trucks					0	0	0	0	0	0	0	0	0	0	0	
Total Intersection Volume		0	0	0	0	211	0	211	0	203	0	245	0	246	0	0	
Intersection Pct Trucks		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Intersection Total	Pct Trucks
One Hour Volumes	Trucks
3:30 PM	0
3:45 PM	211 0.0%
4:00 PM	422 0.0%
4:15 PM	625 0.0%
4:30 PM	870 0.0%
4:45 PM	922 0.0%

Intersection Total	Pct Trucks
One Hour Volumes	Trucks
5:00 PM	957 0.0%
5:15 PM	754 0.0%
5:30 PM	509 0.0%

Notes:

PROJECT: Painted Hills GC
 JOB NO: 13-1166
 INTERSECTION: Dishman-Mica & University/Schafer

Data Transfer
 Intersection No. 1

DATE OF COUNT: 10/7/2015
 Counter: Analyst
 Fred BNG

Whipple Consulting Engineers, Inc.
 PM PEAK HOUR BREAKDOWN

APPROACH	MOVEMENT	5:00 PM		5:15 PM		5:30 PM		5:45 PM		TOTAL	P.H.F.	Pct Trucks
		pass	lrk	pass	lrk	pass	lrk	pass	lrk			
Eastbound	Left	16		15		23		16		70	0.76	0%
	Through	14		14		12		11		51	0.91	0%
	Right	1		2		4		3		10	0.63	0%
	App. Total	31		31		39		30		131	0.84	
	Pct Trucks											
Westbound	Left	4		9		11		7		31	0.70	0%
	Through	21		27		26		29		103	0.89	0%
	Right	0		1		2		2		5	0.63	0%
	App. Total	25		37		39		38		139	0.89	
	Pct Trucks											
Northbound	Left	10		12		12		4		38	0.79	0%
	Through	38		49		45		41		173	0.88	0%
	Right	0		5		2		2		9	0.45	0%
	App. Total	48		66		59		47		220	0.83	
	Pct Trucks											
Southbound	Left	1		8		2		5		16	0.50	0%
	Through	69		68		80		78		295	0.92	0%
	Right	29		35		44		48		156	0.81	0%
	App. Total	99		111		126		131		467	0.89	
	Pct Trucks											
Total Intersection Volume		203		245		263		246		957		0.91
Intersection Pct Trucks		0.0%		0.0%		0.0%		0.0%		0.0%		0.0%

Pedestrian Calls

APPROACH	MOVEMENT	5:00 PM		5:15 PM		5:30 PM		5:45 PM		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
	Westbound									0
	Northbound							1		1
	Southbound									0
	App. Total	0	0	0	0	0	0	1	0	1

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 32nd & Bowdish

Whipple Consulting Engineers, Inc
 TRAFFIC COUNT REDUCTION WORKSHEET

DATE OF COUNT: 10/8/2015
 Counter Analyst

BNG
 RMA

APPROACH	MOVEMENT	15 Minute Period Beginning @														
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM			
		pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	
Eastbound	Left			8		4		4		4		2				
	Through			97	1	80	1	85	1	96	1	115	2	114	1	
	Right			18	1	10		14		11		12		20		
	App. Total	0	0	123	2	98	1	103	1	111	1	129	2	139	1	0
	Pct Trucks			0.016		0.01		0.009		0.015		0.007				
Westbound	Left			13		27	1	25		18		24		20		
	Through			55	2	50		76	1	56	1	63		72		
	Right			7		10		14		11		8		15		
	App. Total	0	0	75	2	87	1	115	1	85	1	95	0	107	0	0
	Pct Trucks			0.026		0.011		0.009		0.012		0		0		
Northbound	Left			11		4		8		2		6		5		
	Through			28	1	18		30		20		21		13	1	
	Right			19		22	1	24		18		13		22		
	App. Total	0	0	58	1	44	1	62	0	40	0	40	0	40	1	0
	Pct Trucks			0.017		0.022		0		0		0		0.024		
Southbound	Left			11		13		4		10		15		9		
	Through			27		14		25	1	29		39		40		
	Right			7		10		6		3		6		5		
	App. Total	0	0	45	0	37	0	35	1	42	0	60	0	54	0	0
	Pct Trucks			0		0	0	0.028		0		0		0		
Total Intersection Volume		0	0	301	5	266	3	315	3	278	2	324	2	340	2	0
Intersection Pct Trucks				1.6%		1.1%		0.9%		0.7%		0.6%		0.6%		0

Intersection Total	Pct Trucks
One Hour Volumes	
3:30 PM	575 1.4%
3:45 PM	893 1.2%
4:00 PM	1173 1.1%
4:15 PM	1193 0.8%
4:30 PM	1266 0.7%
4:45 PM	948 0.6%

Intersection Total	Pct Trucks
One Hour Volumes	
5:00 PM	668 0.6%
5:15 PM	342 0.6%
5:30 PM	0

Notes:

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 32nd & Bowditch

DATE OF COUNT: 10/8/2015
 Counter Analyst
 RMA BNG

Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 32nd & Bowditch

DATE OF COUNT: 10/8/2015
 Counter Analyst
 RMA BNG

Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN

APPROACH	MOVEMENT	4:30 PM		4:45 PM		5:00 PM		5:15 PM		TOTAL	P.H.F.	Pct Trucks
		pass	lrk	pass	lrk	pass	lrk	pass	lrk			
Eastbound	Left			4		2			5	15	0.75	0%
	Through	85	1	96	1	115	2	114	1	415	0.89	1%
	Right	14		11		12		20		57	0.71	0%
	App. Total	103	1	111	1	129	2	139	1	487	0.87	
	Pct Trucks	0.009615		0.008929		0.015267		0.007143				
Westbound	Left	25		18		24		20		87	0.87	0%
	Through	76	1	56	1	63		72		269	0.87	1%
	Right	14		11		8		15		48	0.80	0%
	App. Total	115	1	85	1	95	0	107	0	404	0.87	
	Pct Trucks	0.008621		0.011628		0		0				
Northbound	Left	8		2		6		5		21	0.66	0%
	Through	30		20		21		13	1	85	0.71	1%
	Right	24		18		13		22		77	0.80	0%
	App. Total	62	0	40	0	40	0	40	1	183	0.74	
	Pct Trucks	0		0		0		0.02439				
Southbound	Left	4		10		15		9		38	0.63	0%
	Through	25	1	29		39		40		134	0.84	1%
	Right	6		3		6		5		20	0.83	0%
	App. Total	35	1	42	0	60	0	54	0	192	0.80	
	Pct Trucks	0.027778		0		0		0				
Total Intersection Volume		315		278		324		340		1266		0.93
Intersection Pct Trucks		0.9%		0.7%		0.6%		0.6%				0.6%

Pedestrian Calls

APPROACH	MOVEMENT	4:30 PM		4:45 PM		5:00 PM		5:15 PM		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
Westbound	Through									0
Northbound	Through									0
Southbound	Through									0
App. Total		0	0	0	0	0	0	0	0	0

PROJECT: Painted Hills GC
 JOB NO. 13-1166

Whipple Consulting Engineers, Inc.
 TRAFFIC COUNT REDUCTION WORKSHEET

INTERSECTION: Dishman-Mica & Bowditch

DATE OF COUNT: 1/20/2015
 Counter Analyst
 BNG BNG

PM PEAK HOURS

APPROACH		15 Minute Period Beginning @											
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM
pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk
Eastbound													
Left													
Through													
Right													
App. Total		0	0	0	0	0	0	0	0	0	0	0	0
Pct Trucks													
Westbound													
Left													
Through													
Right													
App. Total		0	0	0	0	0	0	0	0	0	0	0	0
Pct Trucks													
Northbound													
Left													
Through													
Right													
App. Total		0	0	0	0	0	0	0	0	0	0	0	0
Pct Trucks													
Southbound													
Left													
Through													
Right													
App. Total		0	0	0	0	0	0	0	0	0	0	0	0
Pct Trucks													
Total Intersection Volume		0	0	0	0	0	0	0	0	0	0	0	0
Intersection Pct Trucks													

Intersection Total		Pct	
One Hour Volumes	Trucks	Trucks	
3:30 PM	344	1.7%	
3:45 PM	590	1.4%	
4:00 PM	687	1.7%	
4:15 PM	669	1.5%	
4:30 PM	710	1.5%	
4:45 PM	650	1.4%	

Intersection Total			Pct		
One Hour Volumes	Trucks		Trucks		
5:00 PM	722	0.7%			
5:15 PM	525	0.4%			
5:30 PM	355	0.0%			

Notes:

PROJECT: Painted Hills GC
 JOB NO: 13-1166
 INTERSECTION: Dishman-Mica & Bowdish

Data Transfer
 Intersection No. 1

DATE OF COUNT: 1/20/2015
 Counter Analyst
 BNG Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN

APPROACH	MOVEMENT	5:00 PM		5:15 PM		5:30 PM		5:45 PM		TOTAL	P.H.F.	Pct Trucks
		pass	lrk	pass	lrk	pass	lrk	pass	lrk			
Eastbound	Left	5		1		1		4		10	0.50	0%
	Through	62	1	56		49		52		220	0.87	0%
	Right	19		26		32		29		106	0.83	0%
	App. Total	86	1	82	0	82	0	85	0	336	0.97	
	Pct Trucks	0.011494										
Westbound	Left	11		1		4		2		18	0.41	0%
	Through	26	2	27	1	24		19		99	0.88	3%
	Right	7		2		7		5		21	0.75	0%
	App. Total	44	2	30	1	35	0	26	0	138	0.75	
	Pct Trucks	0.043478										
Northbound	Left	10		10		6		13		39	0.75	0%
	Through	19		13		23		25		80	0.80	0%
	Right	6		6		3		1		10	0.42	0%
	App. Total	35	0	23	0	32	0	39	0	129	0.83	
	Pct Trucks	0										
Southbound	Left	1		3		7		2		13	0.46	0%
	Through	25		28	1	29		17		100	0.86	1%
	Right	3		2		1		6		6	0.50	0%
	App. Total	29	0	33	1	37	0	19	0	119	0.80	
	Pct Trucks	0.029412										
Total Intersection Volume		194		168		186		169		722		0.92
Intersection Pct Trucks		1.5%		1.2%		0.0%		0.0%		0.0%		

Pedestrian Calls

APPROACH	MOVEMENT	7:15		7:30		7:45		8:00		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
Westbound	Through									0
Northbound	Through									0
Southbound	Through									0
	App. Total	0	0	0	0	0	0	0	0	0

PROJECT: Painted Hills
 JOB NO: 13-1166
 INTERSECTION: Dishman-Mica & Thorpe

Data Transfer
 Intersection No. 1

DATE OF COUNT: 10/7/2015
 Counter BNG
 Analyst
 Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN

APPROACH	MOVEMENT	4:45 PM		5:00 PM		5:15 PM		5:30 PM		TOTAL	P.H.F.	Pct Trucks
		pass	trk	pass	trk	pass	trk	pass	trk			
Eastbound	Left									0		
	Through									0		
	Right									0		
	App. Total	0	0	0	0	0	0	0	0	0		
Westbound	Pct Trucks										0.53	0%
	Left	2		4		9		4		19		
	Through											
	Right	14		25	1	11		5		56		2%
Northbound	App. Total	16	0	29	1	20	0	9	0	75	0.63	
	Pct Trucks		0		0.033333		0		0			
	Left	23		37	1	32		43		136	0.79	1%
	Through	2		1		4		3		10	0.63	0%
Southbound	Right	25	0	38	1	36	0	46	0	146	0.79	
	App. Total		0		0.025641		0		0			
	Pct Trucks											
	Left	20	1	22		17		10		70	0.80	1%
Total Intersection Volume	Through	46	1	37	1	42		51		178	0.87	1%
	Right											
	App. Total	66	2	59	1	59	0	61	0	248	0.91	
	Pct Trucks		0.029412		0.016667		0		0			
Intersection Pct Trucks		107	2	126	3	115	0	116	0	469	0.91	
			1.8%		2.3%		0.0%		0.0%			

APPROACH	MOVEMENT	7:15		7:30		7:45		8:00		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
	Through									0
	Northbound									0
	Southbound									0
App. Total		0	0	0	0	0	0	0	0	0

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 16th Avenue & Pines Road

Whipple Consulting Engineers, Inc
 TRAFFIC COUNT REDUCTION WORKSHEET

DATE OF COUNT: 10/6/2015
 Counter: Judy
 Analyst: BNG

PM PEAK HOURS

APPROACH	MOVEMENT	15 Minute Period Beginning @													
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM		
		pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk
Eastbound	Left														
	Through														
	Right														
	App. Total	0	0	61	2	85	1	86	1	65	0	106	1	98	0
Pct Trucks			0.032		0.012		0.011		0		0.009		0		0
Westbound	Left														
	Through														
	Right														
	App. Total	0	0	44	3	41	0	44	0	49	0	56	0	51	0
Pct Trucks			0.064		0		0		0		0		0		0
Northbound	Left														
	Through														
	Right														
	App. Total	0	0	36	0	36	0	42	0	52	0	38	0	50	0
Pct Trucks			0		0		0		0		0		0		0
Southbound	Left														
	Through														
	Right														
	App. Total	0	0	41	1	68	1	69	0	75	1	76	1	81	1
Pct Trucks			0.024		0.014		0		0.013		0.013		0.012		0
Total Intersection Volume	0	0	182	6	230	2	241	1	241	1	276	2	280	1	0
Intersection Pct Trucks			3.2%		0.9%		0.4%		0.4%		0.7%		0.4%		0

Intersection Total		Pct
One Hour Volumes	One Hour Volumes	Trucks
3:30 PM	281	0.4%
3:45 PM	0	
4:00 PM	0	
4:15 PM	0	
4:30 PM	0	
4:45 PM	0	

Intersection Total		Pct
One Hour Volumes	One Hour Volumes	Trucks
3:30 PM	662	1.4%
3:45 PM	904	1.1%
4:00 PM	994	0.6%
4:15 PM	1043	0.5%
4:30 PM	801	0.5%
4:45 PM	559	0.5%

Notes:

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 16th Avenue & Pines Road
 DATE OF COUNT: 10/6/2015
 Counter Analyst BNG
 Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN
 Data Transfer Intersection No. 1

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL	P.H.F.	Pct Trucks
		pass	trk	pass	trk	pass	trk	pass	trk			
Eastbound	Left									0		
	Through	75	1	59		92	1	81		309	0.83	1%
	Right	11		6		14		17		48	0.71	0%
	App. Total	86	1	65	0	106	1	98	0	357	0.83	
	Pct Trucks	0.011494		0		0.009346		0				
Westbound	Left	19		12		15		16		62	0.82	0%
	Through	25		37		41		35		138	0.84	0%
	Right									0		
	App. Total	44	0	49	0	56	0	51	0	200	0.89	
	Pct Trucks	0		0		0		0				
Northbound	Left	4		8		2		6		20	0.63	0%
	Through									0		
	Right	38		44		36		44		162	0.92	0%
	App. Total	42	0	52	0	38	0	50	0	182	0.88	
	Pct Trucks	0		0		0		0				
Southbound	Left									0		
	Through	40		55		52		54		201	0.91	0%
	Right	29		20	1	24	1	27	1	103	0.89	3%
	App. Total	69	0	75	1	76	1	81	1	304	0.93	
	Pct Trucks	0		0.013158		0.012987		0.012195				
Total Intersection Volume		241	1	241	1	276	2	280	1	1043	0.93	
Intersection Pct Trucks		0.4%		0.4%		0.7%		0.4%				

Pedestrian Calls

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
Westbound	Through									0
Northbound	Through									0
Southbound	Through									0
	App. Total	0	0	0	0	0	0	0	0	0

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 16th Avenue & SR 27
 Whipple Consulting Engineers, Inc
 TRAFFIC COUNT REDUCTION WORKSHEET

DATE OF COUNT: 10/7/2015
 Counter Analyst
 RMA/JDK BNG

PM PEAK HOURS

APPROACH	MOVEMENT	15 Minute Period Beginning @														
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM			
		pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	
Eastbound	Left					42	1	40	1	42	1	37	1	39	40	
	Through					60	3	63	3	64	1	64	1	52	58	
	Right					10		13		9		15		15	9	
	App. Total	0	0	0	0	112	4	116	4	115	2	116	2	106	0	107
	Pct Trucks					0.009		0.033		0		0.017		0		0.009
Westbound	Left					2		1		3		5		4	2	
	Through					59	1	39	1	42	1	48	1	56	41	
	Right					1		1		4		1		0	1	
	App. Total	0	0	0	0	62	0	41	1	49	0	54	0	60	0	44
	Pct Trucks					0		0.024		0		0		0		0
Northbound	Left					4		2		6		5		8	7	
	Through					59	1	59	1	82	1	51	1	52	1	
	Right					1		1		1		4		3	0	
	App. Total	0	0	0	0	64	1	62	1	89	1	60	1	60	4	
	Pct Trucks					0.015		0		0.011		0.016		0.063		0
Southbound	Left					13		27		24		14		17	16	
	Through					48		55		88		79		71	67	
	Right					0		0		0		0		0	0	
	App. Total	0	0	0	0	61	0	82	0	112	0	93	0	88	0	
	Pct Trucks					0		0		0		0		0		0
Total Intersection Volume		0	0	0	0	299	2	301	5	365	1	323	3	314	4	296
Intersection Pct Trucks						0.7%		1.6%		0.3%		0.9%		1.3%		0.3%

Intersection Total		Pct
One Hour Volumes	Trucks	
5:00 PM	1307	0.7%
5:15 PM	941	0.9%
5:30 PM	615	0.8%

Intersection Total		Pct
One Hour Volumes	Trucks	
3:30 PM	0	
3:45 PM	301	0.7%
4:00 PM	607	1.2%
4:15 PM	973	0.8%
4:30 PM	1299	0.8%
4:45 PM	1316	1.0%

Notes:

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 16th Avenue & SR 27
 Date of Count: 10/7/2015
 Counter Analyst: BNG
 Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN
 Data Transfer Intersection No. 1

APPROACH	MOVEMENT	4:45 PM		5:00 PM		5:15 PM		5:30 PM		TOTAL	P.H.F.	Pct Trucks
		pass	trk	pass	trk	pass	trk	pass	trk			
Eastbound	Left	40	1	42	37	37	1	39	160	0.95	1%	
	Through	63	3	64	64	64	1	52	247	0.94	2%	
	Right	13	0	9	15	15	0	15	52	0.87	0%	
	App. Total	116	4	115	116	116	2	106	459	0.96		
	Pct Trucks	0.033333	0	0	0	0.016949	0	0				
Westbound	Left	1	0	3	5	5	4	4	13	0.65	0%	
	Through	39	1	42	48	48	56	56	186	0.83	1%	
	Right	1	0	4	1	1	0	0	6	0.38	0%	
	App. Total	41	1	49	54	54	60	60	205	0.85		
	Pct Trucks	0.02381	0	0	0	0	0	0				
Northbound	Left	2	0	6	5	5	8	8	21	0.66	0%	
	Through	59	1	82	51	51	52	52	247	0.74	1%	
	Right	1	0	1	4	4	3	3	9	0.56	33%	
	App. Total	62	1	89	60	60	63	63	277	0.77		
	Pct Trucks	0	0	0.011111	0	0.016393	0.0625	0				
Southbound	Left	27	0	24	14	14	17	17	82	0.76	0%	
	Through	55	0	88	79	79	71	71	293	0.83	0%	
	Right	0	0	0	0	0	0	0	0			
	App. Total	82	0	112	93	93	88	88	375	0.84		
	Pct Trucks	0	0	0	0	0	0	0				
Total Intersection Volume		301	5	365	1	323	3	314	4	1316	0.90	
Intersection Pct Trucks		1.6%	0.3%	0.9%	1.3%							

Pedestrian Calls

APPROACH	MOVEMENT	4:45		5:00		5:15		5:30		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
Westbound	Through									0
Northbound	Through							1		1
Southbound	Through									0
	App. Total	0	0	0	0	0	0	1	0	1

PROJECT: Painted Hills GC
 JOB NO: 13-1166
 INTERSECTION: 32nd Avenue & Pines Road

Whipple Consulting Engineers, Inc.
 TRAFFIC COUNT REDUCTION WORKSHEET

DATE OF COUNT: 10/6/2015
 Counter BNG

PM PEAK HOURS

15 Minute Period Beginning @		3:30 PM		3:45 PM		4:00 PM		4:15 PM		4:30 PM		4:45 PM		5:00 PM		5:15 PM		5:30 PM		5:45 PM		6:00 PM		6:15 PM	
APPROACH	MOVEMENT	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk
Eastbound	Left			15	7	10	7	11																	
	Through			119	1	70	2	131	1	88	2	141	1												
	Right			8		5	13	10	11																
	App. Total	0	0	142	1	82	2	154	1	106	2	163	0	91	1	0	0	0	0	0	0	0	0	0	0
	Pct Trucks			0.007		0.024		0.006		0.019		0	0.011												
Westbound	Left			10	16	18	13	23																	
	Through			72	2	58	1	94	1	70		110	62												
	Right			7	10	13	6	12																	
	App. Total	0	0	89	2	84	1	125	1	89	0	145	0	83	0	0	0	0	0	0	0	0	0	0	0
	Pct Trucks			0.022		0.012		0.008		0		0	0												
Northbound	Left			7	1	6	7	12																	
	Through			9	4	16	6	12																	
	Right			12	18	15	5	12																	
	App. Total	0	0	28	1	28	0	38	0	23	0	43	0	31	0	0	0	0	0	0	0	0	0	0	0
	Pct Trucks			0.034		0	0	0					0												
Southbound	Left			24	9	13	15	18																	
	Through			13	12	20	17	23																	
	Right			9	10	6	6	8																	
	App. Total	0	0	46	0	31	0	39	0	38	0	49	0	30	0	0	0	0	0	0	0	0	0	0	0
	Pct Trucks			0	0	0	0	0					0												
Total Intersection Volume		0	0	305	4	225	3	356	2	255	2	400	0	235	1	0	0	0	0	0	0	0	0	0	0
Intersection Pct Trucks				1.3%		1.3%		0.6%		0.8%		0.0%		0.4%											

Intersection Total	Pct
One Hour Volumes	Trucks
3:30 PM	895 1.0%
3:45 PM	1152 1.0%
4:00 PM	1243 0.6%
4:15 PM	1251 0.4%
4:30 PM	893 0.3%
4:45 PM	636 0.2%

Intersection Total	Pct
One Hour Volumes	Trucks
5:00 PM	236 0.4%
5:15 PM	0
5:30 PM	0

Notes:

PROJECT: Painted Hills GC
 JOB NO: 13-1166
 INTERSECTION: 32nd Avenue & Pines Road

Data Transfer
 Intersection No. 1

DATE OF COUNT: 10/6/2015
 Counter Analyst
 BNG Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL	P.H.F.	Pct Trucks	
		pass	lrk	pass	lrk	pass	lrk	pass	lrk				
Eastbound	Left	10		7		11		5		33	0.75	0%	
	Through	131	1	88	2	141		77	1	441	0.78	1%	
	Right	13		10		11		9		43	0.83	0%	
	App. Total	154	1	105	2	163	0	91	1	517	0.79		
	Pct Trucks		0.006452		0.018692		0	0	0.01087				
Westbound	Left	18		13		23		13		67	0.73	0%	
	Through	94	1	70		110		62		337	0.77	0%	
	Right	13		6		12		8		39	0.75	0%	
	App. Total	125	1	89	0	145	0	83	0	443	0.76		
	Pct Trucks		0.007937		0		0	0					
Northbound	Left	7		12		19		8		46	0.61	0%	
	Through	16		6		12		11		45	0.70	0%	
	Right	15		5		12		12		44	0.73	0%	
	App. Total	38	0	23	0	43	0	31	0	135	0.78		
	Pct Trucks		0		0		0	0					
Southbound	Left	13		15		18		8		54	0.75	0%	
	Through	20		17		23		13		73	0.79	0%	
	Right	6		6		8		9		29	0.81	0%	
	App. Total	39	0	38	0	49	0	30	0	156	0.80		
	Pct Trucks		0		0		0	0					
Total Intersection Volume		356		255		400		235		1251		0.78	
Intersection Pct Trucks		0.6%		0.8%		0.0%		0.4%					

Pedestrian Calls

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
	Westbound	1		1				1		3
	Northbound	2				1		1		5
	Southbound					1				1
	App. Total	3	0	0	1	2	1	2	0	9

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 32nd & HWY 27
 Whipple Consulting Engineers, Inc
 TRAFFIC COUNT REDUCTION WORKSHEET

DATE OF COUNT: 10/6/2015
 Counter Analyst
 RMA/JDK BNG

APPROACH	MOVEMENT	15 Minute Period Beginning @														
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM			
		pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	pass	lrk	
Eastbound	Left		11	9	20	19	21	19								
	Through		66	3	70	69	1	60	2	81	2	81	1			
	Right		33	20	35	33	54	46								
	App. Total	0	110	3	99	2	124	1	112	2	156	2	146	1	0	0
	Pct Trucks		0.027		0.008		0.018		0.013		0.007					
Westbound	Left		30	30	1	31	1	31	43	36	1					
	Through		65	2	69	2	50	1	71	1	92					
	Right		7	8	10	6	14	10								
	App. Total	0	102	2	107	3	91	2	108	1	149	0	136	2	0	0
	Pct Trucks		0.019		0.027		0.022		0.009		0		0.014			
Northbound	Left		21	18	1	23	1	28	31	31						
	Through		39	1	32	25	2	39	1	45	41	1				
	Right		26	19	1	22	2	15	2	37	2	16				
	App. Total	0	86	1	69	2	70	4	82	3	113	2	88	1	0	0
	Pct Trucks		0.011		0.028		0.054		0.035		0.017		0.011			
Southbound	Left		9	9	9	10	10	10	11	11						
	Through		48	2	51	44	1	51	48	52	1					
	Right		7	20	11	20	17	15	15	15						
	App. Total	0	64	2	80	0	64	1	81	0	78	1	0	0	0	0
	Pct Trucks		0.03		0		0.015		0		0		0.013			
Total Intersection Volume		0	362	8	355	7	349	8	383	6	493	4	448	5	0	0
Intersection Pct Trucks			2.2%		1.9%		2.2%		1.5%		0.8%		1.1%			

Intersection Total	Pct
One Hour Volumes	Trucks
3:30 PM	1089 2.1%
3:45 PM	1478 2.0%
4:00 PM	1605 1.6%
4:15 PM	1696 1.4%
4:30 PM	1339 1.1%
4:45 PM	950 0.9%

Intersection Total	Pct
Intersection Total	Pct
One Hour Volumes	Trucks
5:00 PM	453 1.1%
5:15 PM	0
5:30 PM	0

Notes:

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 32nd & HWY 27
 DATE OF COUNT: 10/6/2015
 Counter Analyst
 RMA/JDK BNG
 Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN
 Data Transfer Intersection No. 1

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL	P.H.F.	Pct Trucks
		pass	trk	pass	trk	pass	trk	pass	trk			
Eastbound	Left	20	19	60	21	81	19	79	0.94	0%		
	Through	69	1	81	2	81	1	297	0.89	2%		
	Right	35	33	54	54	46	168	0.78	0%			
	App. Total Pct Trucks	124	1	112	2	156	2	544	0.86			
		0.008	0.017544	0.012658	0.006803							
Westbound	Left	31	31	43	36	143	0.83	1%				
	Through	50	1	71	92	306	0.83	1%				
	Right	10	6	14	10	40	0.71	0%				
	App. Total Pct Trucks	91	2	108	1	149	0	489	0.82			
		0.021505	0.009174	0	0.014493							
Northbound	Left	23	28	31	31	113	0.91	0%				
	Through	25	2	39	41	154	0.86	3%				
	Right	22	2	37	2	96	0.62	6%				
	App. Total Pct Trucks	70	4	82	3	113	2	363	0.79			
		0.054054	0.035294	0.017391	0.011236							
Southbound	Left	9	10	10	11	40	0.91	0%				
	Through	44	1	51	52	197	0.93	1%				
	Right	11	20	17	15	63	0.79	0%				
	App. Total Pct Trucks	64	1	81	0	78	1	300	0.93			
		0.015385	0	0	0.012658							
Total Intersection Volume		349	8	383	6	493	4	1696	0.85			
Intersection Pct Trucks		2.2%	1.5%	0.8%	1.1%							

Pedestrian Calls

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through	1		1	2		6			6
	Westbound						0			0
	Northbound						0			0
	Through			1	1	1	3			3
App. Total		1	0	2	0	3	0	3	0	9

DATE OF COUNT: 10/8/2015
 Counter Analyst BNG
 PM PEAK HOURS

APPROACH	MOVEMENT	15 Minute Period Beginning @												Total Intersection Volume		
		3:30 PM	3:45 PM	4:00 PM	4:15 PM	4:30 PM	4:45 PM	5:00 PM	5:15 PM	5:30 PM	5:45 PM	6:00 PM	6:15 PM	pass	lrk	
Eastbound	Left					37	1	45	1	41	1	42	49	1	28	
	Through					44		82	1	74	2	105	82		71	1
	Right															
	App. Total	0	0	0	0	81	1	127	1	115	3	147	131	1	99	1
	Pct Trucks					0.012		0.008		0.025		0	0.008		0.01	
Westbound	Left															
	Through					79	1	73	1	91	1	94	76		74	1
	Right					2		6	1	1		2	1		3	
	App. Total	0	0	0	0	81	1	79	0	92	1	96	77	0	77	1
	Pct Trucks					0.012		0.012		0.011		0	0	0	0.013	
Northbound	Left															
	Through															
	Right															
	App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pct Trucks															
Southbound	Left					2		1		2		7	5		5	
	Through															
	Right					41	1	47	1	43		44	36	1	49	1
	App. Total	0	0	0	0	43	1	48	1	45	0	51	41	1	54	1
	Pct Trucks					0.023		0.02		0	0.446		0	0.018		
Total Intersection Volume		0	0	0	0	205	3	254	2	252	4	294	41	209	1	230
Intersection Pct Trucks						1.4%		0.8%		1.6%		12.2%	0.5%	1.3%		

Intersection Total	Pct	
	One Hour Volumes	Trucks
5:00 PM	1034	4.7%
5:15 PM	778	5.8%
5:30 PM	443	0.9%

Intersection Total	Pct	
	One Hour Volumes	Trucks
3:30 PM	0	
3:45 PM	208	1.4%
4:00 PM	464	1.1%
4:15 PM	720	1.3%
4:30 PM	1055	4.7%
4:45 PM	1057	4.5%

Notes:

PROJECT: Painted Hills GC
 JOB NO: 13-1166
 INTERSECTION: 32nd Avenue & Evergreen Road
 DATE OF COUNT: 10/8/2015
 Counter Analyst
 0 BNG
 Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN
 Data Transfer Intersection No. 1

APPROACH	MOVEMENT	4:45 PM		5:00 PM		5:15 PM		5:30 PM		TOTAL	P.H.F.	Pct Trucks
		pass	lrk	pass	lrk	pass	lrk	pass	lrk			
Eastbound	Left	45	1	41	1	42	1	49	1	179	0.90	1%
	Through	82	1	74	2	105		82		346	0.82	1%
	Right									0		
	App. Total	127	1	115	3	147	0	131	1	525	0.89	
	Pct Trucks	0.007813		0.025424			0	0.007576				
Westbound	Left									0		
	Through	73		91	1	94		76		335	0.89	0%
	Right	6		1		2		1		10	0.42	0%
	App. Total	79	0	92	1	96	0	77	0	345	0.90	
	Pct Trucks		0	0.010753			0		0			
Northbound	Left									0		
	Through									0		
	Right									0		
	App. Total	0	0	0	0	0	0	0	0	0		
	Pct Trucks											
Southbound	Left	1		2		7		5		15	0.31	33%
	Through									0		
	Right	47	1	43		44	36	1		172	0.54	22%
	App. Total	48	1	45	0	51	41	1	0	187	0.51	
	Pct Trucks	0.020408				0.445652			0			
Total Intersection Volume		254	2	252	4	294	41	209	1	1057	0.79	
Intersection Pct Trucks			0.8%		1.6%		12.2%		0.5%			

Pedestrian Calls

APPROACH	MOVEMENT	4:45		5:00		5:15		5:30		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
	Westbound									0
	Northbound							1		1
	Southbound									0
	App. Total	0	0	0	0	0	0	1	0	1

DATE OF COUNT: 10/8/2015
 Counter Analyst
 BNG BNG

PM PEAK HOURS

APPROACH	MOVEMENT	15 Minute Period Beginning @																							
		3:30 PM		3:45 PM		4:00 PM		4:15 PM		4:30 PM		4:45 PM		5:00 PM		5:15 PM		5:30 PM		5:45 PM		6:00 PM		6:15 PM	
		pass	trk	pass	trk	pass	trk	pass	trk	pass	trk	pass	trk	pass	trk	pass	trk	pass	trk	pass	trk	pass	trk	pass	trk
Eastbound	Left		54	3	50	2	45	1	66	2	63	1	63	1	63	1									
	Through																								
	Right		6		5	3	1	6		5															
	App. Total	0	60	3	55	2	48	1	67	2	69	1	68	1	68	1									0
Pct Trucks		0.048		0.035		0.02		0.029		0.014		0.014		0.014											0.014
Westbound	Left																								
	Through																								
	Right																								
	App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pct Trucks																									
Northbound	Left		1	3		5	2	5	2	5	9		9												
	Through		13	2	17	10	1	17	9	11															
	Right																								
	App. Total	0	14	2	20	0	15	1	19	0	14	0	20	0	0	0	0	0	0	0	0	0	0	0	0
Pct Trucks		0.125		0		0.063		0		0		0													
Southbound	Left																								
	Through		30		18	21	19	24		24															
	Right		63	1	50	2	72	1	79	61	1	81													
	App. Total	0	93	1	68	2	93	1	98	0	85	1	105	0	0	0	0	0	0	0	0	0	0	0	0
Pct Trucks		0.011		0.029		0.011		0.012		0		0													
Total Intersection Volume		0	167	6	143	4	156	3	184	2	168	2	193	1	0	0	0	0	0	0	0	0	0	0	0
Intersection Pct Trucks			3.5%		2.7%		1.9%		1.1%		1.2%		0.5%												

Intersection Total		
One Hour Volumes	Trucks	Pct
5:00 PM	194	0.5%
5:15 PM	0	
5:30 PM	0	

Intersection Total		
One Hour Volumes	Trucks	Pct
3:30 PM	479	2.7%
3:45 PM	665	2.3%
4:00 PM	662	1.7%
4:15 PM	709	1.1%
4:30 PM	550	0.9%
4:45 PM	364	0.8%

Notes:

PROJECT: Painted Hills GC
 JOB NO. 13-1166
 INTERSECTION: 32nd Avenue & Sullivan Road

DATE OF COUNT: 10/8/2015
 Counter Analyst
 BNG Whipple Consulting Engineers, Inc
 PM PEAK HOUR BREAKDOWN

Data Transfer
 Intersection No.

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL	P.H.F.	Pct Trucks
		pass	lrk	pass	lrk	pass	lrk	pass	lrk			
Eastbound	Left	45	1	66	2	63	1	63	1	242	0.89	2%
	Through									0		
	Right	3		1		6		5		15	0.63	0%
	App. Total	48	1	67	2	69	1	68	1	257	0.92	
	Pct Trucks	0.020408		0.028986		0.014286		0.014493				
Westbound	Left									0		
	Through									0		
	Right									0		
	App. Total	0	0	0	0	0	0	0	0	0		
	Pct Trucks											
Northbound	Left	5		2		5		9		21	0.58	0%
	Through	10	1	17		9		11		48	0.71	2%
	Right									0		
	App. Total	15	1	19	0	14	0	20	0	69	0.86	
	Pct Trucks	0.0625		0		0		0				
Southbound	Left									0		
	Through	21		19		24		24		88	0.92	0%
	Right	72	1	79		61	1	81		295	0.91	1%
	App. Total	93	1	98	0	85	1	105	0	383	0.91	
	Pct Trucks	0.010638		0		0.011628		0				
Total Intersection Volume		156	3	184	2	168	2	193	1	709	0.91	
Intersection Pct Trucks		1.9%		1.1%		1.2%		0.5%				

Pedestrian Calls

APPROACH	MOVEMENT	4:15 PM		4:30 PM		4:45 PM		5:00 PM		TOTAL
		ped	bike	ped	bike	ped	bike	ped	bike	
Eastbound	Through									0
	Westbound									0
	Northbound							1		1
	Southbound									0
	App. Total	0	0	0	0	0	0	1	0	1

**LEVEL OF SERVICE
TABLES**

Horizon Year 2040 with the Project, with the Background Projects

This scenario assumes that the development has moved forward to completion and the background projects have been completed. The traffic volumes for this condition include the future traffic, as shown on Figures 14 & 15, plus the project trips as shown on Figures 7 & 8. Please see Figures 16 & 17 for the traffic volumes used for this scenario. A summary of the level of service results are shown in the following table.

Table 16 - Year 2040 Levels of Service, with the Project, with the Background Projects

INTERSECTION	(S)ignalized (U)nsignalized (R)oundabout	AM Peak Hour		PM Peak Hour			
		Original Counts		Original Counts		Updated Counts	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
32 nd Ave & University Rd	S	15.6	B	14.7	B	15.4	B
Dishman-Mica Rd & University/Schafer Rd	S	23.3	C	29.1	C	24.5	C
32 nd Ave & Bowdish Rd	S	26.0	C	17.0	B	22.7	C
Dishman-Mica Rd & Bowdish Rd	S	21.6	C	17.3	B	17.7	B
Dishman-Mica Rd & Sundown Dr (Proposed)	U	13.0	B	10.6	B	11.4	B
Dishman-Mica Rd & Thorpe Rd	U	11.8	B	11.5	B	12.8	B
16 th Ave & Pines Rd	U	90.1	F	ERR	F		
• IMP : Remove SB Approach	(U)	(28.1)	(D)	(52.6)	(F)	ERR	F
• ALT IMP : Traffic Circle	(R)	(10.1)	(B)	(14.6)	(B)		
16 th Ave & SR 27	S	61.7	E	42.5	D		
• Redirected Volumes	(S)	(47.2)	(D)	(57.5)	(E)	53.1	D
• ALT IMP : Roundabout	(R)	(12.5)	(B)	(14.2)	(B)		
32 nd Ave & Pines Rd	S	47.3	D	25.8	C	77.6	E
Madison Rd & Painted Hills Ave (Proposed)	U	11.5	B	11.1	B	11.1	B
Madison Rd & 41 st Ave (Proposed)	U	11.1	B	10.8	B	10.8	B
Madison Rd & 43 rd Ave (Proposed)	U	10.9	B	10.4	B	10.4	B
Madison Rd & 44 th Ave (Proposed)	U	9.9	A	9.8	A	9.8	A
Madison Rd & Thorpe Rd	U	13.2	B	10.9	B	10.9	B
32 nd Ave & SR 27	S	36.4	D	39.9	D	46.6	D
32 nd Ave & Evergreen Rd	U	12.8	B	46.4	E	27.0	D
32 nd Ave & Sullivan Rd	U	13.8	B	17.5	C	16.4	C

City of Spokane Valley and WSDOT have established level of service D as the minimum acceptable level for signalized intersections and level of service E for unsignalized and roundabout intersections.

For the horizon year 2040 with the project, most of the study area intersections as shown in Table 16 are anticipated to perform at an acceptable level of service. Except, for the intersection of 16th Avenue & Pines Road which has exceeded the agency standard at level of service F in the AM & PM peak hours. Also, 16th Avenue & State Route 27 has exceeded the agency standard at level of service E during the AM peak hour. The removal of the southbound approach previously suggested only goes so far in reducing traffic safety conflicts and improving the intersection level of service. A solution that was proposed nearly 10 years ago was the installation of a two-lane roundabout at 16th Avenue & State Route 27, with a traffic circle at 16th

Horizon Year 2040 without the Project, with the Background Projects (Planning Level)

This scenario assumes that the development has not moved forward and the background projects have been completed. The traffic volumes for this condition include the existing traffic, as shown on Figures 3 & 4 multiplied by the background growth rate, plus the traffic from the original background projects as shown on Figures 5 & 6. Please see Figures 14 & 15 for the traffic volumes used for this scenario. A summary of the level of service results are shown in the following table.

Table 15 - Year 2040 Levels of Service, without the Project, with the Background Projects

INTERSECTION	(S)ignalized (U)nsignalized	AM Peak Hour		PM Peak Hour			
		Original Counts		Original Counts		Updated Counts	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
32 nd Ave & University Rd	S	15.4	B	14.4	B	15.0	B
Dishman-Mica Rd & University/Schafer Rd	S	22.6	C	23.4	C	21.6	C
32 nd Ave & Bowdish Rd	S	23.7	C	16.0	B	20.6	C
Dishman-Mica Rd & Bowdish Rd	S	16.9	B	14.7	B	15.0	B
Dishman-Mica Rd & Thorpe Rd	U	11.3	B	10.7	B	11.9	B
16 th Ave & Pines Rd • IMP : Remove SB Approach	U	60.0 (24.4)	F (D)	ERR (35.8)	F (E)	ERR	F
16 th Ave & SR 27 • Redirected Volumes	S	57.2 (45.4)	E (D)	41.4 (51.4)	D (D)	51.7	D
32 nd Ave & Pines Rd	S	36.5	D	22.0	C	51.6	D
Madison Rd & Thorpe Rd	U	12.8	B	10.5	B	10.5	B
32 nd Ave & SR 27	S	35.1	D	38.3	D	43.9	D
32 nd Ave & Evergreen Rd	U	12.4	B	48.4	E	24.3	C
32 nd Ave & Sullivan Rd	U	13.3	B	16.9	C	15.9	C

City of Spokane Valley and WSDOT have established level of service D as the minimum acceptable level for signalized intersections and level of service E for unsignalized intersections.

For the year 2040 without the project, most of the study area intersections as shown in Table 15 are anticipated to perform at an acceptable level of service. 16th Avenue & Pines Road has delays that are beyond the agency standard, giving it a level of service F in the AM & PM peak hours. Also, 16th Avenue & State Route 27 has delays that are beyond the agency standard, giving it a level of service E during the AM peak hour.

The intersections levels of service for 16th Avenue & Pines Road and 16th Avenue & State Route 27, can be improved, as well as resolve some of the safety concerns, for the intersection of 16th Avenue & Pines Road. The intersection may be returned to an acceptable level of service by removing the southbound lane and redirecting those trips to the intersection of 16th Avenue & State Route 27. However, this improvement is borderline, and may result further congestion, and may be easily be tipped back to an unacceptable level of service. We recommend that the City of Spokane Valley and WSDOT work on a permanent solution to these intersections.

Year 2020 with the Project, with the Background Projects

This scenario assumes that the development has moved forward to completion and the background projects have been completed. The traffic volumes for this condition include the existing traffic, as shown on Figures 10 & 11, plus the project trips as shown on Figures 7 & 8. Please see Figures 12 & 13 for the traffic volumes used for this scenario. A summary of the level of service results are shown in the following table.

Table 14 - Year 2020 Levels of Service, with the Project, with the Background Projects

INTERSECTION	(S)ignalized (U)nsignalized	AM Peak Hour		PM Peak Hour			
		Original Counts		Original Counts		Updated Counts	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
32 nd Ave & University Rd	S	14.8	B	13.7	B	14.6	B
Dishman-Mica Rd & University/Schafer Rd	S	19.1	B	20.4	C	22.4	C
32 nd Ave & Bowdish Rd	S	17.7	B	13.8	B	16.1	B
Dishman-Mica Rd & Bowdish Rd	S	16.3	B	13.7	B	14.5	B
Dishman-Mica Rd & Sundown Dr (Proposed)	U	11.8	B	10.1	B	10.8	B
Dishman-Mica Rd & Thorpe Rd	U	10.7	B	10.5	B	11.5	B
16 th Ave & Pines Rd	U	21.4	C	41.7	E	61.0	F
16 th Ave & SR 27	S	40.8	D	31.1	C	40.2	D
32 nd Ave & Pines Rd	S	30.9	C	21.0	C	36.2	D
Madison Rd & Painted Hills Ave (Proposed)	U	10.9	B	10.6	B	10.6	B
Madison Rd & 41 st Ave (Proposed)	U	10.6	B	10.3	B	10.3	B
Madison Rd & 43 rd Ave (Proposed)	U	10.3	B	10.0	A	10.0	A
Madison Rd & 44 th Ave (Proposed)	U	9.6	A	9.5	A	9.5	A
Madison Rd & Thorpe Rd	U	11.5	B	10.2	B	10.2	B
32 nd Ave & SR 27	S	28.1	C	30.3	C	36.9	D
32 nd Ave & Evergreen Rd	U	11.1	B	29.4	D	17.1	C
32 nd Ave & Sullivan Rd	U	11.7	B	13.1	B	13.2	B

City of Spokane Valley and WSDOT have established level of service D as the minimum acceptable level for signalized intersections and level of service E for unsignalized intersections.

For the year 2020 with the project the study area intersections as shown in Table 14 are anticipated to perform at an acceptable level of service

FUTURE YEAR TRAFFIC IMPACT ANALYSIS

Future Year Traffic Impact Analysis

Level of service calculations for the Year 2020 & 2040 conditions assumed that the existing traffic volumes as shown on Figures 3 & 4 experience an increase above the 2015 volumes at the established background rate. Two scenarios were examined for the year 2020 (buildout) analysis, as well as the horizon year 2040 (planning level study). The first scenario assumes that the development has not moved forward and analyzes the scoped intersections with the background growth rate and the background project trips. The second scenario assumes that the development has moved forward to completion and is builtout. The scenario analyzes the scoped intersections with the background growth rate, the background projects, and the project trips. These scenarios will allow a determination to be made of what the future conditions may be with and without the project.

Year 2020 without the Project, with the Background Projects

This scenario assumes that the development has not moved forward and the background projects have been completed. The traffic volumes for this condition include the existing traffic, as shown on Figures 3 & 4 multiplied by the background growth rate, plus the traffic from the original background projects as shown on Figures 5 & 6. Please see Figures 10 & 11 for the traffic volumes used for this scenario. A summary of the level of service results are shown in the following table.

For this analysis there were no left turns

Table 13 - Year 2020 Levels of Service, without the Project, with the Background Projects

INTERSECTION	(S)ignalized (U)nsignalized	AM Peak Hour		PM Peak Hour			
		Original Counts		Original Counts		Updated Counts	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
32 nd Ave & University Rd	S	14.7	B	12.5	B	14.3	B
Dishman-Mica Rd & University/Schafer Rd	S	18.0	B	19.2	B	20.1	C
32 nd Ave & Bowdish Rd	S	16.8	B	13.4	B	15.2	B
Dishman-Mica Rd & Bowdish Rd	S	14.3	B	12.4	B	13.1	B
Dishman-Mica Rd & Thorpe Rd	U	10.3	B	9.9	A	10.9	B
16 th Ave & Pines Rd	U	20.7	C	32.6	D	43.6	E
16 th Ave & SR 27	S	39.0	D	30.4	C	39.0	D
32 nd Ave & Pines Rd	S	25.8	C	17.4	B	25.8	C
Madison Rd & Thorpe Rd	U	11.3	B	9.8	A	9.8	A
32 nd Ave & SR 27	S	27.1	C	29.0	C	34.7	C
32 nd Ave & Evergreen Rd	U	10.8	B	27.0	D	16.1	C
32 nd Ave & Sullivan Rd	U	11.4	B	12.9	B	12.9	B

City of Spokane Valley and WSDOT have established level of service D as the minimum acceptable level for signalized intersections and level of service E for unsignalized intersections.

LEVEL OF SERVICE AND TRAFFIC ANALYSIS

Existing Level of Service and Traffic Analysis

The existing levels of service at the existing intersections were calculated using the methods from the *2010 Highway Capacity Manual* as implemented in Synchro, *version 9 - Build 902*. The existing levels of service for the intersections within the study area are summarized on the following table. The existing traffic volumes used for this report are shown on Figures 3 & 4.

Table 2 - Existing Intersections Levels of Service

INTERSECTION	(S)ignalized (U)nsignalized	AM Peak Hour		PM Peak Hour			
		Original Counts		Original Counts		Updated Counts	
		Delay (sec)	LOS	Delay (sec)	LOS	Delay (sec)	LOS
32 nd Ave & University Rd	S	13.6	B	12.4	B	14.0	B
Dishman-Mica Rd & University/Schafer Rd	S	17.8	B	19.0	B	18.8	B
32 nd Ave & Bowdish Rd	S	16.2	B	12.2	B	14.3	B
Dishman-Mica Rd & Bowdish Rd	S	13.8	B	12.1	B	12.3	B
Dishman-Mica Rd & Thorpe Rd	U	10.1	B	9.8	A	10.5	B
16 th Ave & Pines Rd	U	19.5	C	27.7	D	29.3	D
16 th Ave & SR 27	S	37.2	D	29.5	C	36.0	D
32 nd Ave & Pines Rd	S	24.4	C	15.6	B	20.4	C
Madison Rd & Thorpe Rd	U	11.0	B	9.5	A	9.5	A
32 nd Ave & SR 27	S	25.3	C	26.4	C	29.7	C
32 nd Ave & Evergreen Rd	U	10.6	B	24.0	C	14.2	B
32 nd Ave & Sullivan Rd	U	11.1	B	12.5	B	12.1	B

The City of Spokane Valley and WSDOT have established level of service D as the minimum acceptable level for signalized intersections and level of service E for unsignalized intersections.

As shown above the existing intersections within the study area are currently operating within acceptable levels of service.

**LEVEL OF SERVICE
CALCULATIONS
EXISTING CONDITIONS**

HCM Signalized Intersection Capacity Analysis
1: University Rd & 32nd Ave

2015 PM Existing
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↗	↕		↗	↕	
Volume (vph)	2	371	16	72	176	59	19	54	37	97	104	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		0.95			0.95		1.00	0.95		1.00	0.95	
Frt		0.99			0.97		1.00	0.94		1.00	0.99	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3516			3397		1770	3322		1770	3517	
Flt Permitted		0.95			0.78		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3353			2677		1770	3322		1770	3517	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	2	408	18	79	193	65	21	59	41	107	114	5
RTOR Reduction (vph)	0	3	0	0	21	0	0	32	0	0	3	0
Lane Group Flow (vph)	0	425	0	0	316	0	21	68	0	107	116	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		17.9			17.9		1.3	11.4		7.6	17.7	
Effective Green, g (s)		17.9			17.9		1.3	11.4		7.6	17.7	
Actuated g/C Ratio		0.35			0.35		0.03	0.22		0.15	0.35	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)		1179			941		45	744		264	1223	
v/s Ratio Prot							0.01	0.02		c0.06	c0.03	
v/s Ratio Perm		c0.13			0.12							
v/c Ratio		0.36			0.34		0.47	0.09		0.41	0.09	
Uniform Delay, d1		12.2			12.1		24.5	15.6		19.6	11.2	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.4		10.1	0.1		1.4	0.1	
Delay (s)		12.6			12.6		34.5	15.8		21.0	11.3	
Level of Service		B			B		C	B		C	B	
Approach Delay (s)		12.6			12.6			19.0			15.9	
Approach LOS		B			B			B			B	

Intersection Summary

HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	50.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 2: Schafer Rd/University Rd & Dishman-Mica Rd

2015 PM Existing
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↕		↖	↗		↖	↑	↗
Volume (vph)	70	51	10	31	103	5	38	173	9	16	295	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3517		1770	1849		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	3517		1770	1849		1770	1863	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	77	56	11	34	113	5	42	190	10	18	324	171
RTOR Reduction (vph)	0	0	9	0	2	0	0	1	0	0	0	117
Lane Group Flow (vph)	77	56	2	34	116	0	42	199	0	18	324	54
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	custom
Protected Phases	1	6		5	2		7	4		3		
Permitted Phases			6								8	8
Actuated Green, G (s)	5.1	12.9	12.9	2.7	10.5		4.3	21.7		1.2	18.6	18.6
Effective Green, g (s)	5.1	12.9	12.9	2.7	10.5		4.3	21.7		1.2	18.6	18.6
Actuated g/C Ratio	0.09	0.22	0.22	0.05	0.18		0.07	0.37		0.02	0.32	0.32
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	154	410	349	81	631		130	685		36	592	503
v/s Ratio Prot	c0.04	0.03		0.02	c0.03		c0.02	c0.11		0.01		
v/s Ratio Perm			0.00								c0.17	0.03
v/c Ratio	0.50	0.14	0.01	0.42	0.18		0.32	0.29		0.50	0.55	0.11
Uniform Delay, d1	25.5	18.3	17.8	27.1	20.4		25.7	13.0		28.4	16.5	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	3.5	0.2	0.0	4.7	0.2		2.0	0.3		14.1	1.3	0.1
Delay (s)	28.9	18.5	17.8	31.9	20.6		27.7	13.3		42.5	17.8	14.2
Level of Service	C	B	B	C	C		C	B		D	B	B
Approach Delay (s)		24.0			23.1			15.8			17.5	
Approach LOS		C			C			B			B	

Intersection Summary

HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	58.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Bowdish Rd & 32nd Ave

2015 PM Existing
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	415	57	87	269	48	21	85	77	38	134	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.94			0.99	
Fit Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1829		1770	1820			1747			1819	
Fit Permitted	0.56	1.00		0.29	1.00			0.95			0.91	
Satd. Flow (perm)	1042	1829		532	1820			1677			1679	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	16	437	60	92	283	51	22	89	81	40	141	21
RTOR Reduction (vph)	0	5	0	0	5	0	0	36	0	0	5	0
Lane Group Flow (vph)	16	492	0	92	329	0	0	156	0	0	197	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	25.5	24.4		34.5	29.4			12.8			12.8	
Effective Green, g (s)	25.5	24.4		34.5	29.4			12.8			12.8	
Actuated g/C Ratio	0.45	0.43		0.60	0.51			0.22			0.22	
Clearance Time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	477	778		452	933			374			375	
v/s Ratio Prot	0.00	c0.27		c0.02	c0.18							
v/s Ratio Perm	0.01			0.10				0.09			c0.12	
v/c Ratio	0.03	0.63		0.20	0.35			0.42			0.52	
Uniform Delay, d1	8.9	12.9		6.1	8.3			19.1			19.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	1.9		0.2	0.3			1.0			1.7	
Delay (s)	8.9	14.8		6.3	8.6			20.1			21.3	
Level of Service	A	B		A	A			C			C	
Approach Delay (s)		14.6			8.1			20.1			21.3	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Bowdish Rd & Dishman-Mica Rd

2015 PM Existing
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↖	↗
Volume (vph)	10	220	112	23	155	24	48	82	13	9	118	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Frt	1.00	0.95		1.00	0.98			0.99			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.98			1.00	1.00
Satd. Flow (prot)	1770	1769		1770	1826			1809			1856	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.85			0.97	1.00
Satd. Flow (perm)	1770	1769		1770	1826			1557			1814	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	11	232	118	24	163	25	51	86	14	9	124	5
RTOR Reduction (vph)	0	20	0	0	7	0	0	5	0	0	0	4
Lane Group Flow (vph)	11	330	0	24	181	0	0	147	0	0	133	1
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	1.0	16.8		1.1	16.9			10.8			10.8	10.8
Effective Green, g (s)	1.0	16.8		1.1	16.9			10.8			10.8	10.8
Actuated g/C Ratio	0.02	0.39		0.03	0.39			0.25			0.25	0.25
Clearance Time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Grp Cap (vph)	40	687		45	714			389			453	395
v/s Ratio Prot	0.01	c0.19		c0.01	0.10							
v/s Ratio Perm								c0.09			0.07	0.00
v/c Ratio	0.28	0.48		0.53	0.25			0.38			0.29	0.00
Uniform Delay, d1	20.7	9.9		20.8	8.9			13.4			13.1	12.2
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	5.0	0.7		14.6	0.3			0.8			0.5	0.0
Delay (s)	25.8	10.6		35.4	9.1			14.2			13.6	12.2
Level of Service	C	B		D	A			B			B	B
Approach Delay (s)		11.1			12.1			14.2			13.6	
Approach LOS		B			B			B			B	

Intersection Summary		
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service B
HCM 2000 Volume to Capacity ratio	0.44	
Actuated Cycle Length (s)	43.2	Sum of lost time (s) 14.5
Intersection Capacity Utilization	42.3%	ICU Level of Service A
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis
6: Dishman-Mica Rd & Thorpe Rd

2015 PM Existing
10/10/2015



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	19	56	136	10	70	178
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	21	62	149	11	77	196
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	504	155			160	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	504	155			160	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	93			95	
cM capacity (veh/h)	499	891			1419	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	82	160	273
Volume Left	21	0	77
Volume Right	62	11	0
cSH	743	1700	1419
Volume to Capacity	0.11	0.09	0.05
Queue Length 95th (ft)	9	0	4
Control Delay (s)	10.5	0.0	2.5
Lane LOS	B		A
Approach Delay (s)	10.5	0.0	2.5
Approach LOS	B		

Intersection Summary			
Average Delay		3.0	
Intersection Capacity Utilization		35.5%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
7: Pines Rd & 16th Ave

2015 PM Existing
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗			↖			↕			↕	
Volume (veh/h)	0	309	48	62	138	0	20	0	162	0	201	103
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	332	52	67	148	0	22	0	174	0	216	111
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					129							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	148			384			859	640	358	814	666	148
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			384			783	539	358	733	568	0
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			94			83	100	75	100	41	89
cM capacity (veh/h)	1452			1175			126	379	686	215	365	971
Direction, Lane #												
	EB 1	WB 1	NB 1	SB 1								
Volume Total	384	215	196	327								
Volume Left	0	67	22	0								
Volume Right	52	0	174	111								
cSH	1700	1175	460	463								
Volume to Capacity	0.23	0.06	0.43	0.71								
Queue Length 95th (ft)	0	5	52	136								
Control Delay (s)	0.0	2.9	18.5	29.3								
Lane LOS		A	C	D								
Approach Delay (s)	0.0	2.9	18.5	29.3								
Approach LOS			C	D								
Intersection Summary												
Average Delay			12.3									
Intersection Capacity Utilization			69.1%	ICU Level of Service		C						
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
8: Hwy 27 & 16th Ave

2015 PM Existing
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↘	↕		↘	↕	
Volume (vph)	160	247	52	13	186	6	21	247	9	82	293	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	4.0	5.0	5.0		5.0	5.0	
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	1.00	
Flt Protected		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1827	1583		1857	1583	1770	3521		1770	3539	
Flt Permitted		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1827	1583		1857	1583	1770	3521		1770	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	178	274	58	14	207	7	23	274	10	91	326	0
RTOR Reduction (vph)	0	0	39	0	0	7	0	2	0	0	0	0
Lane Group Flow (vph)	0	452	19	0	221	0	23	282	0	91	326	0
Turn Type	Split	NA	Perm	Split	NA	NA	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases			8									
Actuated Green, G (s)		31.6	31.6		18.6	0.0	4.2	16.8		11.4	24.0	
Effective Green, g (s)		31.6	31.6		18.6	0.0	4.2	16.8		11.4	24.0	
Actuated g/C Ratio		0.32	0.32		0.19	0.00	0.04	0.17		0.12	0.24	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	2.5		3.0	1.9	
Lane Grp Cap (vph)		586	508		351	0	75	601		205	863	
v/s Ratio Prot		c0.25			c0.12		0.01	c0.08		c0.05	0.09	
v/s Ratio Perm			0.01									
v/c Ratio		0.77	0.04		0.63	0.00	0.31	0.47		0.44	0.38	
Uniform Delay, d1		30.1	22.9		36.7	49.2	45.7	36.8		40.5	31.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.2	0.0		3.5	0.0	2.3	0.4		1.5	0.1	
Delay (s)		36.4	23.0		40.2	49.2	48.0	37.2		42.1	31.1	
Level of Service		D	C		D	D	D	D		D	C	
Approach Delay (s)		34.8			40.5			38.0			33.5	
Approach LOS		C			D			D			C	

Intersection Summary

HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	98.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 9: Pines Rd & 32nd Ave

2015 PM Existing
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	441	43	67	337	39	46	45	44	54	73	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.93		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	1838		1770	1834		1770	1725		1770	1784	
Flt Permitted	0.40	1.00		0.22	1.00		0.67	1.00		0.59	1.00	
Satd. Flow (perm)	739	1838		415	1834		1254	1725		1100	1784	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	42	565	55	86	432	50	59	58	56	69	94	37
RTOR Reduction (vph)	0	2	0	0	2	0	0	34	0	0	14	0
Lane Group Flow (vph)	42	618	0	86	480	0	59	80	0	69	117	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	39.8	36.1		44.2	38.3		14.0	9.5		17.0	11.0	
Effective Green, g (s)	39.8	36.1		44.2	38.3		14.0	9.5		17.0	11.0	
Actuated g/C Ratio	0.52	0.47		0.58	0.50		0.18	0.12		0.22	0.14	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	434	867		344	918		259	214		296	256	
v/s Ratio Prot	0.00	c0.34		c0.02	0.26		0.01	0.05		c0.02	c0.07	
v/s Ratio Perm	0.05			0.12			0.03			0.03		
v/c Ratio	0.10	0.71		0.25	0.52		0.23	0.37		0.23	0.46	
Uniform Delay, d1	9.3	16.1		9.7	12.9		26.4	30.8		24.1	30.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	5.0		0.4	2.1		0.5	1.5		0.4	1.8	
Delay (s)	9.4	21.0		10.0	15.0		26.9	32.3		24.5	31.8	
Level of Service	A	C		B	B		C	C		C	C	
Approach Delay (s)		20.3			14.3			30.4			29.3	
Approach LOS		C			B			C			C	

Intersection Summary

HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	19.0
Intersection Capacity Utilization	51.7%	ICU Level of Service	A
Analysis Period (min)	15		

Description: Plan 1

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: Hwy 27 & 32nd Ave

2015 PM Existing
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↕↗		↙	↕		↙	↕↗		↙	↕↗	
Volume (vph)	79	297	168	143	306	40	113	154	96	40	197	63
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		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.98		1.00	0.94		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	3347		1770	1830		1770	3335		1770	3411	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3347		1770	1830		1770	3335		1770	3411	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	93	349	198	168	360	47	133	181	113	47	232	74
RTOR Reduction (vph)	0	50	0	0	3	0	0	63	0	0	22	0
Lane Group Flow (vph)	93	497	0	168	404	0	133	231	0	47	284	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	8.8	23.3		14.6	29.1		12.9	21.2		6.6	14.9	
Effective Green, g (s)	8.8	23.3		14.6	29.1		12.9	21.2		6.6	14.9	
Actuated g/C Ratio	0.10	0.27		0.17	0.34		0.15	0.25		0.08	0.17	
Clearance Time (s)	4.5	4.5		4.5	4.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	2.5		3.0	2.7	
Lane Grp Cap (vph)	181	909		301	621		266	824		136	593	
v/s Ratio Prot	0.05	0.15		c0.09	c0.22		c0.08	0.07		0.03	c0.08	
v/s Ratio Perm												
v/c Ratio	0.51	0.55		0.56	0.65		0.50	0.28		0.35	0.48	
Uniform Delay, d1	36.4	26.7		32.6	24.0		33.4	26.1		37.5	31.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.5	0.7		2.2	2.5		1.5	0.1		1.5	0.5	
Delay (s)	38.9	27.4		34.8	26.4		34.9	26.2		39.0	32.4	
Level of Service	D	C		C	C		C	C		D	C	
Approach Delay (s)		29.0			28.9			28.9			33.3	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM 2000 Control Delay	29.7	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.59	
Actuated Cycle Length (s)	85.7	Sum of lost time (s) 20.0
Intersection Capacity Utilization	53.3%	ICU Level of Service A
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis
 16: 32nd Ave & Evergreen Rd

2015 PM Existing
 10/10/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	179	346	0	0	335	10	0	0	0	15	0	172
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)	199	384	0	0	372	11	0	0	0	17	0	191
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		1052										
pX, platoon unblocked				0.93			0.93	0.93	0.93	0.93	0.93	0.93
vC, conflicting volume	383			384			1351	1166	384	1160	1160	378
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	383			304			1340	1141	304	1135	1135	378
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 %	83			100			100	100	100	89	100	71
cM capacity (veh/h)	1175			1172			75	155	686	145	157	669
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2						
Volume Total	199	384	383	0	17	191						
Volume Left	199	0	0	0	17	0						
Volume Right	0	0	11	0	0	191						
cSH	1175	1700	1172	1700	145	669						
Volume to Capacity	0.17	0.23	0.00	0.00	0.11	0.29						
Queue Length 95th (ft)	15	0	0	0	9	29						
Control Delay (s)	8.7	0.0	0.0	0.0	32.9	12.5						
Lane LOS	A			A	D	B						
Approach Delay (s)	3.0		0.0	0.0	14.2							
Approach LOS				A	B							
Intersection Summary												
Average Delay			4.0									
Intersection Capacity Utilization			57.1%		ICU Level of Service				B			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 17: Sullivan Rd & 32nd Ave

2015 PM Existing
 10/10/2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			4	↑	↗
Volume (veh/h)	242	15	21	48	88	295
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	266	16	23	53	97	324
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	196	97	421			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	196	97	421			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	66	98	98			
cM capacity (veh/h)	777	960	1138			
Direction, Lane #	EB 1	NB 1	SB 1	SB 2		
Volume Total	282	76	97	324		
Volume Left	266	23	0	0		
Volume Right	16	0	0	324		
cSH	786	1138	1700	1700		
Volume to Capacity	0.36	0.02	0.06	0.19		
Queue Length 95th (ft)	41	2	0	0		
Control Delay (s)	12.1	2.6	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	12.1	2.6	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay				4.7		
Intersection Capacity Utilization	31.3%			ICU Level of Service	A	
Analysis Period (min)	15					

Year 2020

**LEVEL OF SERVICE
CALCULATIONS**

WITHOUT PROJECT

HCM Signalized Intersection Capacity Analysis
1: University Rd & 32nd Ave

2020 PM W-O Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔		↗	↕↔		↗	↕↔	
Volume (vph)	2	408	17	76	193	64	20	57	39	104	111	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		0.95			0.95		1.00	0.95		1.00	0.95	
Frt		0.99			0.97		1.00	0.94		1.00	0.99	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3517			3399		1770	3324		1770	3518	
Flt Permitted		0.95			0.77		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3355			2644		1770	3324		1770	3518	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	2	448	19	84	212	70	22	63	43	114	122	5
RTOR Reduction (vph)	0	3	0	0	20	0	0	34	0	0	3	0
Lane Group Flow (vph)	0	466	0	0	346	0	22	72	0	114	124	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		19.8			19.8		1.3	11.6		7.8	18.1	
Effective Green, g (s)		19.8			19.8		1.3	11.6		7.8	18.1	
Actuated g/C Ratio		0.37			0.37		0.02	0.22		0.15	0.34	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)		1248			984		43	724		259	1196	
v/s Ratio Prot							0.01	0.02		c0.06	c0.04	
v/s Ratio Perm		c0.14			0.13							
v/c Ratio		0.37			0.35		0.51	0.10		0.44	0.10	
Uniform Delay, d1		12.2			12.1		25.6	16.6		20.7	12.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.5		13.0	0.1		1.6	0.1	
Delay (s)		12.6			12.5		38.6	16.8		22.3	12.1	
Level of Service		B			B		D	B		C	B	
Approach Delay (s)		12.6			12.5			20.5			16.9	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	53.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 2: Schafer Rd/University Rd & Dishman-Mica Rd

2020 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↕		↖	↗		↖	↑	↗
Volume (vph)	74	65	11	33	114	5	40	183	10	18	312	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3519		1770	1848		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	3519		1770	1848		1770	1863	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	81	71	12	36	125	5	44	201	11	20	343	181
RTOR Reduction (vph)	0	0	9	0	2	0	0	1	0	0	0	124
Lane Group Flow (vph)	81	71	3	36	128	0	44	211	0	20	343	57
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	custom
Protected Phases	1	6		5	2		7	4		3		
Permitted Phases			6								8	8
Actuated Green, G (s)	7.5	14.0	14.0	4.3	10.8		4.5	22.7		1.3	19.5	19.5
Effective Green, g (s)	7.5	14.0	14.0	4.3	10.8		4.5	22.7		1.3	19.5	19.5
Actuated g/C Ratio	0.12	0.22	0.22	0.07	0.17		0.07	0.36		0.02	0.31	0.31
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	213	418	355	122	610		127	673		36	583	495
v/s Ratio Prot	c0.05	c0.04		0.02	c0.04		c0.02	c0.11		0.01		
v/s Ratio Perm			0.00								c0.18	0.04
v/c Ratio	0.38	0.17	0.01	0.30	0.21		0.35	0.31		0.56	0.59	0.11
Uniform Delay, d1	25.3	19.5	18.8	27.6	22.1		27.5	14.2		30.2	18.0	15.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.5	0.3	0.0	1.8	0.2		2.2	0.4		20.9	1.8	0.1
Delay (s)	26.8	19.7	18.8	29.4	22.3		29.7	14.6		51.1	19.8	15.4
Level of Service	C	B	B	C	C		C	B		D	B	B
Approach Delay (s)		23.2			23.9			17.2			19.5	
Approach LOS		C			C			B			B	

Intersection Summary

HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	62.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
3: Bowdish Rd & 32nd Ave

2020 PM W-O Proj.
10/10/2015






















Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↕	
Volume (vph)	16	456	60	95	293	52	22	91	84	41	143	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.94			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1830		1770	1820			1746			1819	
Flt Permitted	0.54	1.00		0.26	1.00			0.96			0.90	
Satd. Flow (perm)	1015	1830		479	1820			1677			1650	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	17	480	63	100	308	55	23	96	88	43	151	22
RTOR Reduction (vph)	0	4	0	0	5	0	0	37	0	0	5	0
Lane Group Flow (vph)	17	539	0	100	358	0	0	170	0	0	211	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	27.6	26.5		36.8	31.7			13.3			13.3	
Effective Green, g (s)	27.6	26.5		36.8	31.7			13.3			13.3	
Actuated g/C Ratio	0.46	0.44		0.61	0.53			0.22			0.22	
Clearance Time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	479	806		428	959			371			365	
v/s Ratio Prot	0.00	c0.29		c0.02	c0.20							
v/s Ratio Perm	0.02			0.12				0.10			c0.13	
v/c Ratio	0.04	0.67		0.23	0.37			0.46			0.58	
Uniform Delay, d1	8.9	13.3		6.5	8.4			20.3			20.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	2.3		0.3	0.3			1.2			2.6	
Delay (s)	8.9	15.6		6.8	8.7			21.5			23.5	
Level of Service	A	B		A	A			C			C	
Approach Delay (s)		15.4			8.3			21.5			23.5	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	60.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 4: Bowdish Rd & Dishman-Mica Rd

2020 PM W-O Proj.
 10/10/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	244	118	27	169	26	51	90	22	11	128	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Frt	1.00	0.95		1.00	0.98			0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.98			1.00	1.00
Satd. Flow (prot)	1770	1772		1770	1826			1801			1855	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.85			0.97	1.00
Satd. Flow (perm)	1770	1772		1770	1826			1559			1801	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	257	124	28	178	27	54	95	23	12	135	5
RTOR Reduction (vph)	0	19	0	0	7	0	0	7	0	0	0	4
Lane Group Flow (vph)	12	362	0	28	198	0	0	165	0	0	147	1
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	1.1	18.4		2.5	19.8			11.8			11.8	11.8
Effective Green, g (s)	1.1	18.4		2.5	19.8			11.8			11.8	11.8
Actuated g/C Ratio	0.02	0.39		0.05	0.42			0.25			0.25	0.25
Clearance Time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Grp Cap (vph)	41	690		93	765			389			450	395
v/s Ratio Prot	0.01	c0.20		c0.02	0.11							
v/s Ratio Perm								c0.11			0.08	0.00
v/c Ratio	0.29	0.52		0.30	0.26			0.42			0.33	0.00
Uniform Delay, d1	22.7	11.0		21.5	8.9			14.9			14.5	13.3
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	5.4	0.9		2.5	0.2			1.0			0.6	0.0
Delay (s)	28.0	12.0		24.0	9.2			15.9			15.0	13.3
Level of Service	C	B		C	A			B			B	B
Approach Delay (s)		12.5			10.9			15.9			15.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	47.2	Sum of lost time (s)	14.5
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 6: Dishman-Mica Rd & Thorpe Rd

2020 PM W-O Proj.
 10/10/2015



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑			↔
Volume (veh/h)	21	68	144	13	95	188
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	23	75	158	14	104	207
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	581	165			173	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	581	165			173	
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	91			93	
cM capacity (veh/h)	441	879			1404	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	98	173	311
Volume Left	23	0	104
Volume Right	75	14	0
cSH	712	1700	1404
Volume to Capacity	0.14	0.10	0.07
Queue Length 95th (ft)	12	0	6
Control Delay (s)	10.9	0.0	3.0
Lane LOS	B		A
Approach Delay (s)	10.9	0.0	3.0
Approach LOS	B		

Intersection Summary			
Average Delay		3.5	
Intersection Capacity Utilization		38.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
7: Pines Rd & 16th Ave

2020 PM W-O Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖			↗			↕			↕	
Volume (veh/h)	0	334	52	67	150	0	21	0	175	0	222	109
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	359	56	72	161	0	23	0	188	0	239	117
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					129							
pX, platoon unblocked	0.89						0.89	0.89		0.89	0.89	0.89
vC, conflicting volume	161			415			929	692	387	881	720	161
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			415			856	589	387	801	620	0
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			94			74	100	72	100	29	88
cM capacity (veh/h)	1438			1144			88	349	661	183	335	962

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	415	233	211	356
Volume Left	0	72	23	0
Volume Right	56	0	188	117
cSH	1700	1144	388	427
Volume to Capacity	0.24	0.06	0.54	0.83
Queue Length 95th (ft)	0	5	78	199
Control Delay (s)	0.0	3.0	24.7	43.6
Lane LOS		A	C	E
Approach Delay (s)	0.0	3.0	24.7	43.6
Approach LOS			C	E

Intersection Summary			
Average Delay		17.6	
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
8: Hwy 27 & 16th Ave

2020 PM W-O Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↕		↖	↕	
Volume (vph)	170	264	63	14	198	6	26	285	10	87	353	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	4.0	5.0	5.0		5.0	5.0	
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	1.00	
Flt Protected		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1827	1583		1856	1583	1770	3521		1770	3539	
Flt Permitted		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1827	1583		1856	1583	1770	3521		1770	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	189	293	70	16	220	7	29	317	11	97	392	0
RTOR Reduction (vph)	0	0	47	0	0	7	0	2	0	0	0	0
Lane Group Flow (vph)	0	482	23	0	236	0	29	326	0	97	392	0
Turn Type	Split	NA	Perm	Split	NA	NA	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases			8									
Actuated Green, G (s)		35.4	35.4		20.2	0.0	4.5	18.6		12.0	26.1	
Effective Green, g (s)		35.4	35.4		20.2	0.0	4.5	18.6		12.0	26.1	
Actuated g/C Ratio		0.33	0.33		0.19	0.00	0.04	0.18		0.11	0.25	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	2.5		3.0	1.9	
Lane Grp Cap (vph)		609	527		353	0	75	616		200	869	
v/s Ratio Prot		c0.26			c0.13		0.02	c0.09		c0.05	0.11	
v/s Ratio Perm			0.01									
v/c Ratio		0.79	0.04		0.67	0.00	0.39	0.53		0.48	0.45	
Uniform Delay, d1		32.1	24.0		39.9	53.1	49.5	39.8		44.2	34.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		7.0	0.0		4.7	0.0	3.3	0.6		1.8	0.1	
Delay (s)		39.0	24.0		44.6	53.1	52.8	40.5		46.1	34.1	
Level of Service		D	C		D	D	D	D		D	C	
Approach Delay (s)		37.1			44.9			41.5			36.5	
Approach LOS		D			D			D			D	

Intersection Summary		
HCM 2000 Control Delay	39.0	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.66	D
Actuated Cycle Length (s)	106.2	Sum of lost time (s)
Intersection Capacity Utilization	65.1%	20.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		C

HCM Signalized Intersection Capacity Analysis
 9: Pines Rd & 32nd Ave

2020 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	486	47	80	368	41	50	53	60	57	90	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Fr _t	1.00	0.99		1.00	0.98		1.00	0.92		1.00	0.96	
Fl _t Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1838		1770	1835		1770	1714		1770	1791	
Fl _t Permitted	0.33	1.00		0.13	1.00		0.61	1.00		0.63	1.00	
Satd. Flow (perm)	624	1838		233	1835		1133	1714		1166	1791	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	45	623	60	103	472	53	64	68	77	73	115	40
RTOR Reduction (vph)	0	2	0	0	3	0	0	39	0	0	12	0
Lane Group Flow (vph)	45	681	0	103	522	0	64	106	0	73	143	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	36.5	32.7		41.7	35.3		18.3	12.3		18.5	12.4	
Effective Green, g (s)	36.5	32.7		41.7	35.3		18.3	12.3		18.5	12.4	
Actuated g/C Ratio	0.48	0.43		0.55	0.46		0.24	0.16		0.24	0.16	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	354	785		255	846		320	275		330	290	
v/s Ratio Prot	0.01	c0.37		c0.03	0.28		0.02	0.06		c0.02	c0.08	
v/s Ratio Perm	0.05			0.19			0.03			0.04		
v/c Ratio	0.13	0.87		0.40	0.62		0.20	0.39		0.22	0.49	
Uniform Delay, d ₁	11.3	19.9		12.9	15.5		23.0	28.7		22.9	29.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d ₂	0.2	12.4		1.0	3.4		0.3	1.2		0.3	1.8	
Delay (s)	11.5	32.3		14.0	18.9		23.3	30.0		23.3	31.0	
Level of Service	B	C		B	B		C	C		C	C	
Approach Delay (s)		31.0			18.1			27.9			28.5	
Approach LOS		C			B			C			C	

Intersection Summary

HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	76.5	Sum of lost time (s)	19.0
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

Description: Plan 1

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 15: Hwy 27 & 32nd Ave

2020 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↕↗		↙	↗		↙	↕↗		↙	↕↗	
Volume (vph)	83	323	206	184	330	48	134	185	120	53	248	68
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		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	0.98		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3333		1770	1828		1770	3331		1770	3425	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3333		1770	1828		1770	3331		1770	3425	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	98	380	242	216	388	56	158	218	141	62	292	80
RTOR Reduction (vph)	0	66	0	0	3	0	0	68	0	0	18	0
Lane Group Flow (vph)	98	556	0	216	441	0	158	291	0	62	354	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	11.5	25.3		18.3	32.1		15.0	25.1		7.7	17.8	
Effective Green, g (s)	11.5	25.3		18.3	32.1		15.0	25.1		7.7	17.8	
Actuated g/C Ratio	0.12	0.26		0.19	0.33		0.16	0.26		0.08	0.18	
Clearance Time (s)	4.5	4.5		4.5	4.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	2.5		3.0	2.7	
Lane Grp Cap (vph)	211	874		336	608		275	867		141	632	
v/s Ratio Prot	0.06	0.17		c0.12	c0.24		c0.09	0.09		0.04	c0.10	
v/s Ratio Perm												
v/c Ratio	0.46	0.64		0.64	0.72		0.57	0.34		0.44	0.56	
Uniform Delay, d1	39.6	31.5		36.0	28.3		37.7	28.9		42.3	35.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	1.5		4.2	4.3		2.9	0.2		2.2	1.0	
Delay (s)	41.2	33.0		40.2	32.5		40.6	29.1		44.5	36.8	
Level of Service	D	C		D	C		D	C		D	D	
Approach Delay (s)		34.1			35.1			32.6			37.9	
Approach LOS		C			D			C			D	

Intersection Summary

HCM 2000 Control Delay	34.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	96.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 16: 32nd Ave & Evergreen Rd

2020 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↘			↔			↔		↙	↘	
Volume (veh/h)	198	382	0	0	381	11	0	0	0	16	0	201
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)	220	424	0	0	423	12	0	0	0	18	0	223
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		1052										
pX, platoon unblocked				0.90			0.90	0.90	0.90	0.90	0.90	0.90
vC, conflicting volume	436			424			1517	1300	424	1294	1294	429
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	436			309			1519	1278	309	1272	1272	429
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 %	80			100			100	100	100	84	100	64
cM capacity (veh/h)	1124			1130			48	121	660	111	122	626

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2
Volume Total	220	424	436	0	18	223
Volume Left	220	0	0	0	18	0
Volume Right	0	0	12	0	0	223
cSH	1124	1700	1130	1700	111	626
Volume to Capacity	0.20	0.25	0.00	0.00	0.16	0.36
Queue Length 95th (ft)	18	0	0	0	14	40
Control Delay (s)	9.0	0.0	0.0	0.0	43.6	13.9
Lane LOS	A			A	E	B
Approach Delay (s)	3.1		0.0	0.0	16.1	
Approach LOS				A	C	

Intersection Summary		
Average Delay		4.4
Intersection Capacity Utilization	63.3%	ICU Level of Service B
Analysis Period (min)		15

HCM Unsignalized Intersection Capacity Analysis
 17: Sullivan Rd & 32nd Ave

2020 PM W-O Proj.
 10/10/2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	LT			TH	TH	RT
Volume (veh/h)	273	16	23	51	93	338
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	300	18	25	56	102	371
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	209	102	474			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	209	102	474			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	61	98	98			
cM capacity (veh/h)	761	953	1088			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	318	81	102	371
Volume Left	300	25	0	0
Volume Right	18	0	0	371
cSH	770	1088	1700	1700
Volume to Capacity	0.41	0.02	0.06	0.22
Queue Length 95th (ft)	51	2	0	0
Control Delay (s)	12.9	2.7	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.9	2.7	0.0	
Approach LOS	B			

Intersection Summary			
Average Delay		5.0	
Intersection Capacity Utilization		33.4%	ICU Level of Service A
Analysis Period (min)		15	

Year 2020

**LEVEL OF SERVICE
CALCULATIONS**

WITH PROJECT

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HCM Signalized Intersection Capacity Analysis
 1: University Rd & 32nd Ave

2020 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Volume (vph)	2	419	17	76	200	68	20	76	39	110	129	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		0.95			0.95		1.00	0.95		1.00	0.95	
Frt		0.99			0.97		1.00	0.95		1.00	0.99	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3518			3397		1770	3359		1770	3521	
Flt Permitted		0.95			0.77		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3355			2645		1770	3359		1770	3521	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	2	460	19	84	220	75	22	84	43	121	142	5
RTOR Reduction (vph)	0	3	0	0	21	0	0	34	0	0	3	0
Lane Group Flow (vph)	0	478	0	0	358	0	22	93	0	121	144	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		20.6			20.6		1.3	11.8		8.1	18.6	
Effective Green, g (s)		20.6			20.6		1.3	11.8		8.1	18.6	
Actuated g/C Ratio		0.38			0.38		0.02	0.22		0.15	0.34	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)		1268			999		42	727		263	1201	
v/s Ratio Prot							0.01	0.03		c0.07	c0.04	
v/s Ratio Perm		c0.14			0.14							
v/c Ratio		0.38			0.36		0.52	0.13		0.46	0.12	
Uniform Delay, d1		12.3			12.2		26.3	17.2		21.2	12.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.5		14.5	0.2		1.7	0.1	
Delay (s)		12.7			12.7		40.8	17.4		22.9	12.4	
Level of Service		B			B		D	B		C	B	
Approach Delay (s)		12.7			12.7			20.8			17.2	
Approach LOS		B			B			C			B	
Intersection Summary												
HCM 2000 Control Delay			14.6			HCM 2000 Level of Service				B		
HCM 2000 Volume to Capacity ratio			0.33									
Actuated Cycle Length (s)			54.5			Sum of lost time (s)			14.0			
Intersection Capacity Utilization			47.4%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
 2: Schafer Rd/University Rd & Dishman-Mica Rd

2020 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↕		↖	↗		↖	↑	↗
Volume (vph)	74	205	11	33	191	24	40	183	10	36	312	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3481		1770	1848		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	3481		1770	1848		1770	1863	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	81	225	12	36	210	26	44	201	11	40	343	181
RTOR Reduction (vph)	0	0	9	0	8	0	0	1	0	0	0	126
Lane Group Flow (vph)	81	225	3	36	228	0	44	211	0	40	343	55
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	custom
Protected Phases	1	6		5	2		7	4		3		
Permitted Phases			6								8	8
Actuated Green, G (s)	7.8	18.4	18.4	4.4	15.0		4.6	20.7		4.5	20.6	20.6
Effective Green, g (s)	7.8	18.4	18.4	4.4	15.0		4.6	20.7		4.5	20.6	20.6
Actuated g/C Ratio	0.11	0.27	0.27	0.06	0.22		0.07	0.30		0.07	0.30	0.30
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	203	504	428	114	767		119	562		117	564	479
v/s Ratio Prot	c0.05	c0.12		0.02	0.07		c0.02	0.11		0.02		
v/s Ratio Perm			0.00								c0.18	0.03
v/c Ratio	0.40	0.45	0.01	0.32	0.30		0.37	0.37		0.34	0.61	0.11
Uniform Delay, d1	27.9	20.6	18.1	30.4	22.1		30.3	18.6		30.3	20.3	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	1.8	0.9	0.0	2.2	0.3		2.6	0.6		2.4	2.2	0.1
Delay (s)	29.7	21.4	18.1	32.5	22.4		33.0	19.1		32.7	22.4	17.3
Level of Service	C	C	B	C	C		C	B		C	C	B
Approach Delay (s)		23.4			23.7			21.5			21.5	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.52	
Actuated Cycle Length (s)	68.0	Sum of lost time (s) 20.0
Intersection Capacity Utilization	50.5%	ICU Level of Service A
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis
 3: Bowdish Rd & 32nd Ave

2020 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗			↕			↕	
Volume (vph)	16	473	60	101	302	55	24	100	88	46	156	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.94			0.99	
Fit Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1831		1770	1820			1748			1820	
Fit Permitted	0.54	1.00		0.24	1.00			0.95			0.88	
Satd. Flow (perm)	1003	1831		447	1820			1672			1617	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	17	498	63	106	318	58	25	105	93	48	164	22
RTOR Reduction (vph)	0	4	0	0	6	0	0	36	0	0	5	0
Lane Group Flow (vph)	17	557	0	106	370	0	0	187	0	0	229	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	28.1	27.0		37.5	32.4			14.0			14.0	
Effective Green, g (s)	28.1	27.0		37.5	32.4			14.0			14.0	
Actuated g/C Ratio	0.46	0.44		0.61	0.53			0.23			0.23	
Clearance Time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	472	803		412	958			380			368	
v/s Ratio Prot	0.00	c0.30		c0.03	c0.20							
v/s Ratio Perm	0.02			0.13				0.11			c0.14	
v/c Ratio	0.04	0.69		0.26	0.39			0.49			0.62	
Uniform Delay, d1	9.2	13.9		7.0	8.6			20.7			21.4	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	2.8		0.3	0.4			1.4			3.7	
Delay (s)	9.2	16.7		7.3	9.0			22.0			25.0	
Level of Service	A	B		A	A			C			C	
Approach Delay (s)		16.5			8.6			22.0			25.0	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	61.5	Sum of lost time (s)	14.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Bowdish Rd & Dishman-Mica Rd

2020 PM W- Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	402	118	30	265	41	51	90	32	30	128	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Fr _t	1.00	0.97		1.00	0.98			0.97			1.00	0.85
Fl _t Protected	0.95	1.00		0.95	1.00			0.99			0.99	1.00
Satd. Flow (prot)	1770	1799		1770	1825			1790			1845	1583
Fl _t Permitted	0.95	1.00		0.95	1.00			0.85			0.92	1.00
Satd. Flow (perm)	1770	1799		1770	1825			1543			1721	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	12	423	124	32	279	43	54	95	34	32	135	5
RTOR Reduction (vph)	0	10	0	0	6	0	0	10	0	0	0	4
Lane Group Flow (vph)	12	537	0	32	316	0	0	173	0	0	167	1
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	1.3	25.3		2.8	26.8			12.1			12.1	12.1
Effective Green, g (s)	1.3	25.3		2.8	26.8			12.1			12.1	12.1
Actuated g/C Ratio	0.02	0.46		0.05	0.49			0.22			0.22	0.22
Clearance Time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Grp Cap (vph)	42	832		90	894			341			380	350
v/s Ratio Prot	0.01	c0.30		c0.02	0.17							
v/s Ratio Perm								c0.11			0.10	0.00
v/c Ratio	0.29	0.65		0.36	0.35			0.51			0.44	0.00
Uniform Delay, d ₁	26.2	11.3		25.1	8.6			18.7			18.4	16.6
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d ₂	5.1	1.9		3.3	0.3			1.6			1.1	0.0
Delay (s)	31.3	13.2		28.4	8.9			20.3			19.5	16.6
Level of Service	C	B		C	A			C			B	B
Approach Delay (s)		13.6			10.7			20.3			19.4	
Approach LOS		B			B			C			B	

Intersection Summary

HCM 2000 Control Delay	14.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	54.7	Sum of lost time (s)	14.5
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 5: Dishman-Mica Rd & Sundown Drive

2020 PM W- Proj.
 10/10/2015



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Volume (veh/h)	3	74	253	6	131	339
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	80	275	7	142	368
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						1112
pX, platoon unblocked	0.85					
vC, conflicting volume	932	278			282	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	832	278			282	
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	89			89	
cM capacity (veh/h)	256	761			1281	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	84	282	511			
Volume Left	3	0	142			
Volume Right	80	7	0			
cSH	706	1700	1281			
Volume to Capacity	0.12	0.17	0.11			
Queue Length 95th (ft)	10	0	9			
Control Delay (s)	10.8	0.0	3.1			
Lane LOS	B		A			
Approach Delay (s)	10.8	0.0	3.1			
Approach LOS	B					
Intersection Summary						
Average Delay			2.8			
Intersection Capacity Utilization			53.5%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 6: Dishman-Mica Rd & Thorpe Rd

2020 PM W- Proj.
 10/10/2015



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	26	83	151	19	117	192
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	29	91	166	21	129	211
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	645	176			187	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	645	176			187	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	89			91	
cM capacity (veh/h)	396	867			1388	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	120	187	340			
Volume Left	29	0	129			
Volume Right	91	21	0			
cSH	676	1700	1388			
Volume to Capacity	0.18	0.11	0.09			
Queue Length 95th (ft)	16	0	8			
Control Delay (s)	11.5	0.0	3.5			
Lane LOS	B		A			
Approach Delay (s)	11.5	0.0	3.5			
Approach LOS	B					
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization			42.2%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: Pines Rd & 16th Ave

2020 PM W- Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗			↖			↕			↕	
Volume (veh/h)	0	334	55	72	150	0	24	0	189	0	246	109
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	359	59	77	161	0	26	0	203	0	265	117
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)					129							
pX, platoon unblocked	0.88						0.88	0.88		0.88	0.88	0.88
vC, conflicting volume	161			418			954	705	389	908	734	161
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			418			882	599	389	829	633	0
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			93			60	100	69	100	19	88
cM capacity (veh/h)	1433			1141			65	342	660	168	327	958
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	418	239	229	382								
Volume Left	0	77	26	0								
Volume Right	59	0	203	117								
cSH	1700	1141	324	410								
Volume to Capacity	0.25	0.07	0.71	0.93								
Queue Length 95th (ft)	0	5	127	259								
Control Delay (s)	0.0	3.1	39.0	61.0								
Lane LOS		A	E	F								
Approach Delay (s)	0.0	3.1	39.0	61.0								
Approach LOS			E	F								
Intersection Summary												
Average Delay			26.0									
Intersection Capacity Utilization			77.5%		ICU Level of Service					D		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
8: Hwy 27 & 16th Ave

2020 PM W- Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕	↗		↕	↗	↗	↕↗		↗	↕↗		
Volume (vph)	176	273	63	14	203	6	26	289	10	87	359	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0	5.0		5.0	4.0	5.0	5.0		5.0	5.0		
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	1.00		1.00	1.00		
Flt Protected		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)		1827	1583		1857	1583	1770	3522		1770	3539		
Flt Permitted		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (perm)		1827	1583		1857	1583	1770	3522		1770	3539		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	196	303	70	16	226	7	29	321	11	97	399	0	
RTOR Reduction (vph)	0	0	46	0	0	7	0	2	0	0	0	0	
Lane Group Flow (vph)	0	499	24	0	242	0	29	330	0	97	399	0	
Turn Type	Split	NA	Perm	Split	NA	NA	Prot	NA		Prot	NA		
Protected Phases	8	8		4	4		1	6		5	2		
Permitted Phases			8										
Actuated Green, G (s)		37.1	37.1		20.7	0.0	4.5	18.9		12.1	26.5		
Effective Green, g (s)		37.1	37.1		20.7	0.0	4.5	18.9		12.1	26.5		
Actuated g/C Ratio		0.34	0.34		0.19	0.00	0.04	0.17		0.11	0.24		
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0		
Vehicle Extension (s)		3.0	3.0		3.0		3.0	2.5		3.0	1.9		
Lane Grp Cap (vph)		622	539		353	0	73	611		196	861		
v/s Ratio Prot		c0.27			c0.13		0.02	c0.09		c0.05	0.11		
v/s Ratio Perm			0.02										
v/c Ratio		0.80	0.04		0.69	0.00	0.40	0.54		0.49	0.46		
Uniform Delay, d1		32.5	24.0		41.0	54.4	50.8	41.0		45.5	35.1		
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		
Incremental Delay, d2		7.4	0.0		5.4	0.0	3.5	0.8		2.0	0.1		
Delay (s)		39.9	24.0		46.5	54.4	54.4	41.8		47.4	35.2		
Level of Service		D	C		D	D	D	D		D	D		
Approach Delay (s)		37.9			46.7			42.8			37.6		
Approach LOS		D			D			D			D		
Intersection Summary													
HCM 2000 Control Delay			40.2		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.68										
Actuated Cycle Length (s)			108.8		Sum of lost time (s)						20.0		
Intersection Capacity Utilization			66.3%		ICU Level of Service						C		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
 9: Pines Rd & 32nd Ave

2020 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	35	490	70	126	374	41	63	70	107	57	122	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.91		1.00	0.97	
Fit Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1828		1770	1835		1770	1694		1770	1806	
Fit Permitted	0.36	1.00		0.11	1.00		0.47	1.00		0.43	1.00	
Satd. Flow (perm)	675	1828		199	1835		883	1694		798	1806	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	45	628	90	162	479	53	81	90	137	73	156	40
RTOR Reduction (vph)	0	4	0	0	3	0	0	51	0	0	8	0
Lane Group Flow (vph)	45	714	0	162	529	0	81	176	0	73	188	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	36.9	32.9		47.7	39.2		21.8	15.1		21.0	14.7	
Effective Green, g (s)	36.9	32.9		47.7	39.2		21.8	15.1		21.0	14.7	
Actuated g/C Ratio	0.44	0.39		0.57	0.47		0.26	0.18		0.25	0.18	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	350	719		307	860		301	305		273	317	
v/s Ratio Prot	0.01	c0.39		c0.07	0.29		c0.02	c0.10		0.02	0.10	
v/s Ratio Perm	0.05			0.24			0.05			0.05		
v/c Ratio	0.13	0.99		0.53	0.62		0.27	0.58		0.27	0.59	
Uniform Delay, d1	13.7	25.2		15.7	16.6		24.0	31.3		24.6	31.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	32.0		1.6	3.3		0.5	3.2		0.5	3.4	
Delay (s)	13.9	57.3		17.4	19.9		24.5	34.5		25.1	35.1	
Level of Service	B	E		B	B		C	C		C	D	
Approach Delay (s)		54.7			19.3			31.9			32.4	
Approach LOS		D			B			C			C	

Intersection Summary

HCM 2000 Control Delay	36.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	83.6	Sum of lost time (s)	19.0
Intersection Capacity Utilization	66.4%	ICU Level of Service	C
Analysis Period (min)	15		

Description: Plan 1

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: Hwy 27 & 32nd Ave

2020 PM W- Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖↗		↖	↗		↖	↖↗		↖	↖↗	
Volume (vph)	87	343	213	184	365	48	145	185	120	53	248	74
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		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	0.98		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3336		1770	1830		1770	3331		1770	3417	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3336		1770	1830		1770	3331		1770	3417	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	102	404	251	216	429	56	171	218	141	62	292	87
RTOR Reduction (vph)	0	58	0	0	2	0	0	69	0	0	20	0
Lane Group Flow (vph)	102	597	0	216	483	0	171	290	0	62	359	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	11.9	33.5		18.6	40.2		16.1	26.2		7.9	18.0	
Effective Green, g (s)	11.9	33.5		18.6	40.2		16.1	26.2		7.9	18.0	
Actuated g/C Ratio	0.11	0.32		0.18	0.38		0.15	0.25		0.07	0.17	
Clearance Time (s)	4.5	4.5		4.5	4.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	2.5		3.0	2.7	
Lane Grp Cap (vph)	198	1052		310	692		268	821		131	579	
v/s Ratio Prot	0.06	0.18		c0.12	c0.26		c0.10	0.09		0.04	c0.11	
v/s Ratio Perm												
v/c Ratio	0.52	0.57		0.70	0.70		0.64	0.35		0.47	0.62	
Uniform Delay, d1	44.4	30.3		41.2	27.9		42.3	33.0		47.2	40.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.3	0.7		6.7	3.1		4.9	0.2		2.7	1.9	
Delay (s)	46.7	31.0		47.8	30.9		47.2	33.2		49.8	42.8	
Level of Service	D	C		D	C		D	C		D	D	
Approach Delay (s)		33.1			36.1			37.7			43.8	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	36.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	106.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 16: 32nd Ave & Evergreen Rd

2020 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	205	394	0	0	401	11	0	0	0	16	0	216
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)	228	438	0	0	446	12	0	0	0	18	0	240
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)		1052										
pX, platoon unblocked				0.89			0.89	0.89	0.89	0.89	0.89	
vC, conflicting volume	458			438			1585	1351	438	1345	1345	452
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	458			312			1595	1334	312	1327	1327	452
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 %	79			100			100	100	100	82	100	61
cM capacity (veh/h)	1103			1116			39	109	651	100	110	608
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2						
Volume Total	228	438	458	0	18	240						
Volume Left	228	0	0	0	18	0						
Volume Right	0	0	12	0	0	240						
cSH	1103	1700	1116	1700	100	608						
Volume to Capacity	0.21	0.26	0.00	0.00	0.18	0.39						
Queue Length 95th (ft)	19	0	0	0	15	47						
Control Delay (s)	9.1	0.0	0.0	0.0	48.8	14.7						
Lane LOS	A			A	E	B						
Approach Delay (s)	3.1		0.0	0.0	17.1							
Approach LOS				A	C							
Intersection Summary												
Average Delay			4.7									
Intersection Capacity Utilization			65.9%		ICU Level of Service					C		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 17: Sullivan Rd & 32nd Ave

2020 PM W- Proj.
 10/10/2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	285	16	23	51	93	358
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	313	18	25	56	102	393
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	209	102	496			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	209	102	496			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	59	98	98			
cM capacity (veh/h)	761	953	1068			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	331	81	102	393
Volume Left	313	25	0	0
Volume Right	18	0	0	393
cSH	769	1068	1700	1700
Volume to Capacity	0.43	0.02	0.06	0.23
Queue Length 95th (ft)	54	2	0	0
Control Delay (s)	13.2	2.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	13.2	2.8	0.0	
Approach LOS	B			

Intersection Summary			
Average Delay		5.0	
Intersection Capacity Utilization		34.1%	ICU Level of Service A
Analysis Period (min)		15	

Year 2040

**LEVEL OF SERVICE
CALCULATIONS**

WITHOUT PROJECT

HCM Signalized Intersection Capacity Analysis
 1: University Rd & 32nd Ave

2040 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↗	↕		↖	↕	
Volume (vph)	3	504	21	95	238	80	25	71	49	130	138	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		0.95			0.95		1.00	0.95		1.00	0.95	
Frt		0.99			0.97		1.00	0.94		1.00	0.99	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3517			3397		1770	3322		1770	3513	
Flt Permitted		0.95			0.73		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3353			2500		1770	3322		1770	3513	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	3	554	23	104	262	88	27	78	54	143	152	8
RTOR Reduction (vph)	0	3	0	0	19	0	0	44	0	0	4	0
Lane Group Flow (vph)	0	577	0	0	435	0	27	88	0	143	156	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		24.8			24.8		2.9	11.2		8.9	17.2	
Effective Green, g (s)		24.8			24.8		2.9	11.2		8.9	17.2	
Actuated g/C Ratio		0.42			0.42		0.05	0.19		0.15	0.29	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)		1411			1052		87	631		267	1025	
v/s Ratio Prot							0.02	0.03		c0.08	c0.04	
v/s Ratio Perm		0.17			c0.17							
v/c Ratio		0.41			0.41		0.31	0.14		0.54	0.15	
Uniform Delay, d1		11.9			12.0		27.0	19.8		23.1	15.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.6		2.8	0.2		2.6	0.1	
Delay (s)		12.3			12.5		29.8	20.1		25.7	15.6	
Level of Service		B			B		C	C		C	B	
Approach Delay (s)		12.3			12.5			21.7			20.4	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	58.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 2: Schafer Rd/University Rd & Dishman-Mica Rd

2040 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	78	13	41	140	7	50	227	12	22	388	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3513		1770	1849		1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	3513		1770	1849		1770	1863	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	101	86	14	45	154	8	55	249	13	24	426	225
RTOR Reduction (vph)	0	0	11	0	3	0	0	1	0	0	0	139
Lane Group Flow (vph)	101	86	3	45	159	0	55	261	0	24	426	86
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	custom
Protected Phases	1	6		5	2		7	4		3		
Permitted Phases			6								8	8
Actuated Green, G (s)	8.5	14.9	14.9	4.8	11.2		5.1	29.8		2.9	27.6	27.6
Effective Green, g (s)	8.5	14.9	14.9	4.8	11.2		5.1	29.8		2.9	27.6	27.6
Actuated g/C Ratio	0.12	0.21	0.21	0.07	0.15		0.07	0.41		0.04	0.38	0.38
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	207	383	325	117	543		124	761		70	710	603
v/s Ratio Prot	c0.06	c0.05		0.03	c0.05		c0.03	0.14		0.01		
v/s Ratio Perm			0.00								c0.23	0.05
v/c Ratio	0.49	0.22	0.01	0.38	0.29		0.44	0.34		0.34	0.60	0.14
Uniform Delay, d1	29.9	23.9	22.9	32.4	27.1		32.3	14.6		33.8	18.0	14.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.5	0.4	0.0	2.9	0.4		3.4	0.4		4.0	1.6	0.1
Delay (s)	32.4	24.3	22.9	35.2	27.5		35.7	15.0		37.8	19.6	14.8
Level of Service	C	C	C	D	C		D	B		D	B	B
Approach Delay (s)		28.3			29.2			18.6			18.6	
Approach LOS		C			C			B			B	

Intersection Summary

HCM 2000 Control Delay	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	72.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 3: Bowdish Rd & 32nd Ave

2040 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	564	75	117	363	64	28	113	104	51	177	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.94			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1830		1770	1821			1746			1819	
Flt Permitted	0.50	1.00		0.13	1.00			0.94			0.86	
Satd. Flow (perm)	937	1830		250	1821			1658			1580	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	594	79	123	382	67	29	119	109	54	186	27
RTOR Reduction (vph)	0	5	0	0	5	0	0	35	0	0	5	0
Lane Group Flow (vph)	21	668	0	123	444	0	0	222	0	0	262	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	28.2	27.1		38.0	32.9			15.8			15.8	
Effective Green, g (s)	28.2	27.1		38.0	32.9			15.8			15.8	
Actuated g/C Ratio	0.44	0.42		0.60	0.52			0.25			0.25	
Clearance Time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	428	777		313	939			410			391	
v/s Ratio Prot	0.00	c0.37		c0.04	0.24							
v/s Ratio Perm	0.02			0.19				0.13			c0.17	
v/c Ratio	0.05	0.86		0.39	0.47			0.54			0.67	
Uniform Delay, d1	10.1	16.6		9.7	9.9			20.8			21.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	9.9		0.8	0.5			1.8			4.7	
Delay (s)	10.1	26.5		10.5	10.4			22.7			26.4	
Level of Service	B	C		B	B			C			C	
Approach Delay (s)		26.0			10.4			22.7			26.4	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	63.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 4: Bowdish Rd & Dishman-Mica Rd

2040 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	301	147	33	209	33	63	111	25	13	158	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Fr _t	1.00	0.95		1.00	0.98			0.98			1.00	0.85
Fl _t Protected	0.95	1.00		0.95	1.00			0.98			1.00	1.00
Satd. Flow (prot)	1770	1771		1770	1824			1803			1856	1583
Fl _t Permitted	0.95	1.00		0.95	1.00			0.84			0.97	1.00
Satd. Flow (perm)	1770	1771		1770	1824			1539			1801	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	317	155	35	220	35	66	117	26	14	166	7
RTOR Reduction (vph)	0	19	0	0	7	0	0	6	0	0	0	5
Lane Group Flow (vph)	14	453	0	35	248	0	0	203	0	0	180	2
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	1.2	20.3		2.7	21.8			14.0			14.0	14.0
Effective Green, g (s)	1.2	20.3		2.7	21.8			14.0			14.0	14.0
Actuated g/C Ratio	0.02	0.39		0.05	0.42			0.27			0.27	0.27
Clearance Time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Grp Cap (vph)	41	698		92	772			418			489	430
v/s Ratio Prot	0.01	c0.26		c0.02	0.14							
v/s Ratio Perm								c0.13			0.10	0.00
v/c Ratio	0.34	0.65		0.38	0.32			0.49			0.37	0.00
Uniform Delay, d ₁	24.8	12.7		23.6	9.9			15.7			15.2	13.7
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d ₂	6.7	2.3		3.6	0.3			1.2			0.6	0.0
Delay (s)	31.4	15.0		27.2	10.2			16.9			15.8	13.7
Level of Service	C	B		C	B			B			B	B
Approach Delay (s)		15.5			12.3			16.9			15.7	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	51.5	Sum of lost time (s)	14.5
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 6: Dishman-Mica Rd & Thorpe Rd

2040 PM W-O Proj.
 10/10/2015



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Volume (veh/h)	26	83	179	15	113	234
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	29	91	197	16	124	257
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	710	205			213	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	710	205			213	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	89			91	
cM capacity (veh/h)	363	836			1357	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	120	213	381
Volume Left	29	0	124
Volume Right	91	16	0
cSH	638	1700	1357
Volume to Capacity	0.19	0.13	0.09
Queue Length 95th (ft)	17	0	8
Control Delay (s)	11.9	0.0	3.2
Lane LOS	B		A
Approach Delay (s)	11.9	0.0	3.2
Approach LOS	B		

Intersection Summary			
Average Delay		3.7	
Intersection Capacity Utilization		45.5%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
7: Pines Rd & 16th Ave

2040 PM W-O Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBF
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	0	414	64	84	185	0	26	0	217	0	274	135
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	445	69	90	199	0	28	0	233	0	295	145
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)					129							
pX, platoon unblocked	0.85						0.85	0.85		0.85	0.85	0.85
vC, conflicting volume	199			514			1152	859	480	1092	894	199
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			514			1091	748	480	1022	788	0
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			91			0	100	60	100	0	84
cM capacity (veh/h)	1383			1052			0	266	586	103	252	924

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	514	289	261	440
Volume Left	0	90	28	0
Volume Right	69	0	233	145
cSH	1700	1052	0	331
Volume to Capacity	0.30	0.09	Err	1.33
Queue Length 95th (ft)	0	7	Err	533
Control Delay (s)	0.0	3.3	Err	198.8
Lane LOS		A	F	F
Approach Delay (s)	0.0	3.3	Err	198.8
Approach LOS			F	F

Intersection Summary			
Average Delay		Err	
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
8: Hwy 27 & 16th Ave

2040 PM W-O Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖ ↗	↗		↖ ↗	↗	↖ ↗	↖ ↗		↖ ↗	↖ ↗	
Volume (vph)	211	328	76	17	247	8	32	349	12	108	429	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	4.0	5.0	5.0		5.0	5.0	
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	1.00		1.00	1.00	
Flt Protected		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1827	1583		1857	1583	1770	3522		1770	3539	
Flt Permitted		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1827	1583		1857	1583	1770	3522		1770	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	234	364	84	19	274	9	36	388	13	120	477	0
RTOR Reduction (vph)	0	0	50	0	0	9	0	2	0	0	0	0
Lane Group Flow (vph)	0	598	34	0	293	0	36	399	0	120	477	0
Turn Type	Split	NA	Perm	Split	NA	NA	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases			8									
Actuated Green, G (s)		50.5	50.5		25.4	0.0	6.9	20.9		14.4	28.4	
Effective Green, g (s)		50.5	50.5		25.4	0.0	6.9	20.9		14.4	28.4	
Actuated g/C Ratio		0.38	0.38		0.19	0.00	0.05	0.16		0.11	0.22	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	2.5		3.0	1.9	
Lane Grp Cap (vph)		703	609		359	0	93	561		194	766	
v/s Ratio Prot		c0.33			c0.16		0.02	c0.11		c0.07	c0.13	
v/s Ratio Perm			0.02									
v/c Ratio		0.85	0.06		0.82	0.00	0.39	0.71		0.62	0.62	
Uniform Delay, d1		36.9	25.4		50.7	65.6	60.1	52.3		55.8	46.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		9.7	0.0		13.3	0.0	2.7	4.0		5.8	1.1	
Delay (s)		46.6	25.4		64.0	65.6	62.8	56.3		61.5	47.7	
Level of Service		D	C		E	E	E	E		E	D	
Approach Delay (s)		44.0			64.1			56.8			50.5	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	51.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	131.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 9: Pines Rd & 32nd Ave

2040 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	600	59	97	455	51	61	64	72	71	109	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.98		1.00	0.92		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	1838		1770	1835		1770	1715		1770	1790	
Flt Permitted	0.21	1.00		0.11	1.00		0.53	1.00		0.55	1.00	
Satd. Flow (perm)	383	1838		210	1835		984	1715		1021	1790	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	55	769	76	124	583	65	78	82	92	91	140	49
RTOR Reduction (vph)	0	2	0	0	3	0	0	37	0	0	11	0
Lane Group Flow (vph)	55	843	0	124	645	0	78	137	0	91	178	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	36.4	32.4		42.4	35.4		20.3	13.9		20.7	14.1	
Effective Green, g (s)	36.4	32.4		42.4	35.4		20.3	13.9		20.7	14.1	
Actuated g/C Ratio	0.46	0.41		0.54	0.45		0.26	0.18		0.26	0.18	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	247	754		251	823		316	302		330	319	
v/s Ratio Prot	0.01	c0.46		c0.04	0.35		0.02	0.08		c0.02	c0.10	
v/s Ratio Perm	0.09			0.22			0.04			0.05		
v/c Ratio	0.22	1.12		0.49	0.78		0.25	0.45		0.28	0.56	
Uniform Delay, d1	13.7	23.3		15.8	18.5		22.8	29.1		22.7	29.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	70.0		1.5	7.4		0.4	1.5		0.5	2.6	
Delay (s)	14.1	93.3		17.3	25.9		23.2	30.6		23.1	32.1	
Level of Service	B	F		B	C		C	C		C	C	
Approach Delay (s)		88.5			24.5			28.3			29.2	
Approach LOS		F			C			C			C	

Intersection Summary

HCM 2000 Control Delay	51.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	78.9	Sum of lost time (s)	19.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		
Description: Plan 1			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: Hwy 27 & 32nd Ave

2040 PM W-O Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	104	399	250	221	409	59	164	224	145	64	299	84
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		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	0.98		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3335		1770	1828		1770	3331		1770	3423	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3335		1770	1828		1770	3331		1770	3423	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	122	469	294	260	481	69	193	264	171	75	352	99
RTOR Reduction (vph)	0	60	0	0	3	0	0	67	0	0	18	0
Lane Group Flow (vph)	122	703	0	260	547	0	193	368	0	75	433	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	13.8	34.1		22.8	43.1		18.5	31.2		9.0	21.7	
Effective Green, g (s)	13.8	34.1		22.8	43.1		18.5	31.2		9.0	21.7	
Actuated g/C Ratio	0.12	0.29		0.19	0.37		0.16	0.27		0.08	0.19	
Clearance Time (s)	4.5	4.5		4.5	4.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	2.5		3.0	2.7	
Lane Grp Cap (vph)	208	971		344	672		279	887		136	634	
v/s Ratio Prot	0.07	0.21		c0.15	c0.30		c0.11	0.11		0.04	c0.13	
v/s Ratio Perm												
v/c Ratio	0.59	0.72		0.76	0.81		0.69	0.41		0.55	0.68	
Uniform Delay, d1	48.9	37.3		44.5	33.4		46.6	35.4		52.1	44.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.2	2.7		9.1	7.5		7.2	0.2		4.8	2.9	
Delay (s)	53.1	40.0		53.6	40.9		53.8	35.6		56.9	47.4	
Level of Service	D	D		D	D		D	D		E	D	
Approach Delay (s)		41.8			45.0			41.2			48.7	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	43.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	117.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 16: 32nd Ave & Evergreen Rd

2040 PM W-O Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	244	472	0	0	467	13	0	0	0	20	0	245
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)	271	524	0	0	519	14	0	0	0	22	0	272
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		1052										
pX, platoon unblocked				0.84			0.84	0.84	0.84	0.84	0.84	
vC, conflicting volume	533			524			1865	1600	524	1593	1593	526
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	533			341			1934	1619	341	1610	1610	526
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 %	74			100			100	100	100	61	100	51
cM capacity (veh/h)	1034			1025			17	64	590	56	65	552
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2						
Volume Total	271	524	533	0	22	272						
Volume Left	271	0	0	0	22	0						
Volume Right	0	0	14	0	0	272						
cSH	1034	1700	1025	1700	56	552						
Volume to Capacity	0.26	0.31	0.00	0.00	0.39	0.49						
Queue Length 95th (ft)	26	0	0	0	36	68						
Control Delay (s)	9.7	0.0	0.0	0.0	105.3	17.7						
Lane LOS	A			A	F	C						
Approach Delay (s)	3.3		0.0	0.0	24.3							
Approach LOS				A	C							
Intersection Summary												
Average Delay			6.0									
Intersection Capacity Utilization			75.4%		ICU Level of Service					D		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 17: Sullivan Rd & 32nd Ave

2040 PM W-O Proj.
 10/10/2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (veh/h)	335	20	29	63	116	414
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	368	22	32	69	127	455
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	260	127	582			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	260	127	582			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	48	98	97			
cM capacity (veh/h)	705	923	992			
Direction, Lane #	EB 1	NB 1	SB 1	SB 2		
Volume Total	390	101	127	455		
Volume Left	368	32	0	0		
Volume Right	22	0	0	455		
cSH	715	992	1700	1700		
Volume to Capacity	0.55	0.03	0.07	0.27		
Queue Length 95th (ft)	83	2	0	0		
Control Delay (s)	15.9	3.0	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	15.9	3.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			6.1			
Intersection Capacity Utilization			38.0%	ICU Level of Service		A
Analysis Period (min)			15			

Year 2040

**LEVEL OF SERVICE
CALCULATIONS**

WITH PROJECT

HCM Signalized Intersection Capacity Analysis
 1: University Rd & 32nd Ave

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		EBT			WBT		NBL	NBT		SBL	SBT	
Volume (vph)	3	515	21	95	245	84	25	90	49	136	156	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		0.95			0.95		1.00	0.95		1.00	0.95	
Fr _t		0.99			0.97		1.00	0.95		1.00	0.99	
Fit Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3518			3396		1770	3352		1770	3515	
Fit Permitted		0.95			0.72		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		3354			2485		1770	3352		1770	3515	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	3	566	23	104	269	92	27	99	54	149	171	8
RTOR Reduction (vph)	0	2	0	0	20	0	0	44	0	0	4	0
Lane Group Flow (vph)	0	590	0	0	445	0	27	109	0	149	175	0
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4			4								
Actuated Green, G (s)		25.3			25.3		2.9	11.6		9.1	17.8	
Effective Green, g (s)		25.3			25.3		2.9	11.6		9.1	17.8	
Actuated g/C Ratio		0.42			0.42		0.05	0.19		0.15	0.30	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Grp Cap (vph)		1414			1047		85	648		268	1042	
v/s Ratio Prot							0.02	0.03		c0.08	c0.05	
v/s Ratio Perm		0.18			c0.18							
v/c Ratio		0.42			0.43		0.32	0.17		0.56	0.17	
Uniform Delay, d1		12.2			12.2		27.6	20.2		23.6	15.6	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.6		2.9	0.3		3.1	0.2	
Delay (s)		12.6			12.8		30.5	20.4		26.6	15.8	
Level of Service		B			B		C	C		C	B	
Approach Delay (s)		12.6			12.8			22.0			20.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 2: Schafer Rd/University Rd & Dishman-Mica Rd

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↕		↖	↗		↖	↑	↗
Volume (vph)	92	218	13	41	217	26	50	227	12	40	388	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.99		1.00	1.00	0.85
Fit Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	3482		1770	1849		1770	1863	1583
Fit Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	3482		1770	1849		1770	1863	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	101	240	14	45	238	29	55	249	13	44	426	225
RTOR Reduction (vph)	0	0	11	0	8	0	0	1	0	0	0	145
Lane Group Flow (vph)	101	240	3	45	259	0	55	261	0	44	426	80
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	custom
Protected Phases	1	6		5	2		7	4		3		
Permitted Phases			6								8	8
Actuated Green, G (s)	8.8	19.1	19.1	4.9	15.2		5.2	27.7		4.9	27.4	27.4
Effective Green, g (s)	8.8	19.1	19.1	4.9	15.2		5.2	27.7		4.9	27.4	27.4
Actuated g/C Ratio	0.11	0.25	0.25	0.06	0.20		0.07	0.36		0.06	0.36	0.36
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	6.0		4.0	6.0	6.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Grp Cap (vph)	203	464	394	113	690		120	668		113	666	566
v/s Ratio Prot	c0.06	c0.13		0.03	0.07		c0.03	0.14		0.02		
v/s Ratio Perm			0.00								c0.23	0.05
v/c Ratio	0.50	0.52	0.01	0.40	0.38		0.46	0.39		0.39	0.64	0.14
Uniform Delay, d1	31.8	24.8	21.6	34.4	26.6		34.3	18.2		34.4	20.5	16.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.6	1.3	0.0	3.1	0.5		3.7	0.5		3.0	2.3	0.2
Delay (s)	34.4	26.1	21.6	37.6	27.1		38.1	18.7		37.4	22.8	16.8
Level of Service	C	C	C	D	C		D	B		D	C	B
Approach Delay (s)		28.3			28.6			22.1			21.8	
Approach LOS		C			C			C			C	

Intersection Summary

HCM 2000 Control Delay	24.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	76.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 3: Bowdish Rd & 32nd Ave

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	581	75	123	372	67	30	122	108	56	190	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	0.98			0.94			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1770	1831		1770	1820			1748			1820	
Flt Permitted	0.50	1.00		0.13	1.00			0.94			0.84	
Satd. Flow (perm)	923	1831		240	1820			1646			1551	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	612	79	129	392	71	32	128	114	59	200	27
RTOR Reduction (vph)	0	5	0	0	6	0	0	33	0	0	5	0
Lane Group Flow (vph)	21	686	0	129	457	0	0	241	0	0	281	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	28.2	27.1		38.1	33.0			16.6			16.6	
Effective Green, g (s)	28.2	27.1		38.1	33.0			16.6			16.6	
Actuated g/C Ratio	0.44	0.42		0.59	0.51			0.26			0.26	
Clearance Time (s)	4.0	5.0		4.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	416	766		306	928			422			397	
v/s Ratio Prot	0.00	c0.37		c0.05	0.25							
v/s Ratio Perm	0.02			0.20				0.15			c0.18	
v/c Ratio	0.05	0.90		0.42	0.49			0.57			0.71	
Uniform Delay, d1	10.4	17.5		10.5	10.4			20.9			21.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	13.3		0.9	0.6			2.2			6.1	
Delay (s)	10.5	30.8		11.4	10.9			23.2			27.9	
Level of Service	B	C		B	B			C			C	
Approach Delay (s)		30.2			11.0			23.2			27.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	64.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 4: Bowdish Rd & Dishman-Mica Rd

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	459	147	36	305	48	63	111	35	32	158	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Frt	1.00	0.96		1.00	0.98			0.98			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	1.00
Satd. Flow (prot)	1770	1795		1770	1824			1794			1847	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.84			0.93	1.00
Satd. Flow (perm)	1770	1795		1770	1824			1527			1728	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	14	483	155	38	321	51	66	117	37	34	166	7
RTOR Reduction (vph)	0	12	0	0	7	0	0	8	0	0	0	5
Lane Group Flow (vph)	14	626	0	38	365	0	0	212	0	0	200	2
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	1	6		5	2			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	1.4	26.2		3.1	27.9			14.9			14.9	14.9
Effective Green, g (s)	1.4	26.2		3.1	27.9			14.9			14.9	14.9
Actuated g/C Ratio	0.02	0.45		0.05	0.48			0.25			0.25	0.25
Clearance Time (s)	4.0	5.5		4.0	5.5			5.0			5.0	5.0
Vehicle Extension (s)	4.0	4.0		4.0	4.0			4.0			4.0	4.0
Lane Grp Cap (vph)	42	801		93	866			387			438	401
v/s Ratio Prot	0.01	c0.35		c0.02	0.20							
v/s Ratio Perm								c0.14			0.12	0.00
v/c Ratio	0.33	0.78		0.41	0.42			0.55			0.46	0.00
Uniform Delay, d1	28.2	13.8		26.9	10.1			19.0			18.5	16.4
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2	6.3	5.3		4.0	0.5			2.0			1.0	0.0
Delay (s)	34.5	19.1		30.9	10.6			21.0			19.5	16.4
Level of Service	C	B		C	B			C			B	B
Approach Delay (s)		19.4			12.4			21.0			19.4	
Approach LOS		B			B			C			B	

Intersection Summary			
HCM 2000 Control Delay	17.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	58.7	Sum of lost time (s)	14.5
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane_Group			

HCM Unsignalized Intersection Capacity Analysis
 5: Dishman-Mica Rd & Sundown Drive

2040 PM W- Proj.
 10/10/2015



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			R
Volume (veh/h)	3	74	302	6	131	403
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	80	328	7	142	438
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						1112
pX, platoon unblocked	0.77					
vC, conflicting volume	1054	332			335	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	923	332			335	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	89			88	
cM capacity (veh/h)	204	710			1225	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	84	335	580
Volume Left	3	0	142
Volume Right	80	7	0
cSH	648	1700	1225
Volume to Capacity	0.13	0.20	0.12
Queue Length 95th (ft)	11	0	10
Control Delay (s)	11.4	0.0	3.0
Lane LOS	B		A
Approach Delay (s)	11.4	0.0	3.0
Approach LOS	B		

Intersection Summary			
Average Delay		2.7	
Intersection Capacity Utilization		59.5%	ICU Level of Service B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 6: Dishman-Mica Rd & Thorpe Rd

2040 PM W- Proj.
 10/10/2015



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Volume (veh/h)	31	98	186	21	135	238
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	34	108	204	23	148	262
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	774	216			227	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	774	216			227	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	87			89	
cM capacity (veh/h)	326	824			1341	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	142	227	410
Volume Left	34	0	148
Volume Right	108	23	0
cSH	603	1700	1341
Volume to Capacity	0.24	0.13	0.11
Queue Length 95th (ft)	23	0	9
Control Delay (s)	12.8	0.0	3.6
Lane LOS	B		A
Approach Delay (s)	12.8	0.0	3.6
Approach LOS	B		

Intersection Summary			
Average Delay		4.2	
Intersection Capacity Utilization		48.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 7: Pines Rd & 16th Ave

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗			↖			↕			↕	
Volume (veh/h)	0	414	67	89	185	0	29	0	231	0	298	135
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	445	72	96	199	0	31	0	248	0	320	145
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					129							
pX, platoon unblocked	0.85						0.85	0.85		0.85	0.85	0.85
vC, conflicting volume	199			517			1177	872	481	1120	908	199
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			517			1119	759	481	1052	802	0
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			91			0	100	58	100	0	84
cM capacity (veh/h)	1378			1049			0	259	585	93	245	921
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	517	295	280	466								
Volume Left	0	96	31	0								
Volume Right	72	0	248	145								
cSH	1700	1049	0	317								
Volume to Capacity	0.30	0.09	Err	1.47								
Queue Length 95th (ft)	0	8	Err	635								
Control Delay (s)	0.0	3.5	Err	257.5								
Lane LOS		A	F	F								
Approach Delay (s)	0.0	3.5	Err	257.5								
Approach LOS			F	F								
Intersection Summary												
Average Delay			Err									
Intersection Capacity Utilization			92.6%		ICU Level of Service				F			
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
8: Hwy 27 & 16th Ave

2040 PM W- Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↕↔		↔	↕↔	
Volume (vph)	217	337	76	17	252	8	32	353	12	108	435	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	4.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Fr _t		1.00	0.85		1.00	0.85	1.00	1.00		1.00	1.00	
Fl _t Protected		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1827	1583		1857	1583	1770	3522		1770	3539	
Fl _t Permitted		0.98	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1827	1583		1857	1583	1770	3522		1770	3539	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	241	374	84	19	280	9	36	392	13	120	483	0
RTOR Reduction (vph)	0	0	51	0	0	9	0	2	0	0	0	0
Lane Group Flow (vph)	0	615	33	0	299	0	36	403	0	120	483	0
Turn Type	Split	NA	Perm	Split	NA	NA	Prot	NA		Prot	NA	
Protected Phases	8	8		4	4		1	6		5	2	
Permitted Phases			8									
Actuated Green, G (s)		50.5	50.5		25.9	0.0	6.9	21.2		14.4	28.7	
Effective Green, g (s)		50.5	50.5		25.9	0.0	6.9	21.2		14.4	28.7	
Actuated g/C Ratio		0.38	0.38		0.20	0.00	0.05	0.16		0.11	0.22	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		3.0	2.5		3.0	1.9	
Lane Grp Cap (vph)		698	605		364	0	92	565		193	769	
v/s Ratio Prot		c0.34			c0.16		0.02	c0.11		c0.07	c0.14	
v/s Ratio Perm			0.02									
v/c Ratio		0.88	0.06		0.82	0.00	0.39	0.71		0.62	0.63	
Uniform Delay, d ₁		38.0	25.7		50.8	66.0	60.5	52.5		56.2	46.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d ₂		12.5	0.0		13.8	0.0	2.7	4.0		6.1	1.2	
Delay (s)		50.5	25.7		64.7	66.0	63.3	56.5		62.3	48.0	
Level of Service		D	C		E	E	E	E		E	D	
Approach Delay (s)		47.5			64.7			57.1			50.8	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	53.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	132.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 9: Pines Rd & 32nd Ave

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	43	604	82	143	461	51	74	81	119	71	141	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.91		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1829		1770	1835		1770	1696		1770	1803	
Flt Permitted	0.20	1.00		0.11	1.00		0.41	1.00		0.37	1.00	
Satd. Flow (perm)	374	1829		204	1835		764	1696		687	1803	
Peak-hour factor, PHF	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	55	774	105	183	591	65	95	104	153	91	181	49
RTOR Reduction (vph)	0	4	0	0	3	0	0	48	0	0	9	0
Lane Group Flow (vph)	55	875	0	183	653	0	95	209	0	91	221	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	37.4	32.0		47.7	37.8		23.6	16.4		23.0	16.1	
Effective Green, g (s)	37.4	32.0		47.7	37.8		23.6	16.4		23.0	16.1	
Actuated g/C Ratio	0.44	0.37		0.56	0.44		0.28	0.19		0.27	0.19	
Clearance Time (s)	4.5	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	4.0		3.0	4.0	
Lane Grp Cap (vph)	251	684		318	811		295	325		272	339	
v/s Ratio Prot	0.01	c0.48		c0.08	c0.36		c0.03	c0.12		0.03	0.12	
v/s Ratio Perm	0.08			0.24			0.06			0.06		
v/c Ratio	0.22	1.28		0.58	0.81		0.32	0.64		0.33	0.65	
Uniform Delay, d1	15.7	26.8		16.2	20.7		23.9	31.8		24.3	32.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	136.9		2.5	8.4		0.6	4.8		0.7	4.9	
Delay (s)	16.1	163.6		18.7	29.0		24.5	36.6		25.1	37.0	
Level of Service	B	F		B	C		C	D		C	D	
Approach Delay (s)		155.0			26.8			33.3			33.6	
Approach LOS		F			C			C			C	

Intersection Summary

HCM 2000 Control Delay	77.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	85.5	Sum of lost time (s)	19.0
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

Description: Plan 1

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: Hwy 27 & 32nd Ave

2040 PM W- Proj.
10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	419	257	221	444	59	175	224	145	64	299	90
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		5.5	5.5		5.5	5.5	
Lane Util. Factor	1.00	0.95		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	0.98		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3338		1770	1830		1770	3331		1770	3416	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3338		1770	1830		1770	3331		1770	3416	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	127	493	302	260	522	69	206	264	171	75	352	106
RTOR Reduction (vph)	0	57	0	0	3	0	0	67	0	0	20	0
Lane Group Flow (vph)	127	738	0	260	588	0	206	368	0	75	438	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.3	35.3		23.0	44.0		19.7	32.9		9.1	22.3	
Effective Green, g (s)	14.3	35.3		23.0	44.0		19.7	32.9		9.1	22.3	
Actuated g/C Ratio	0.12	0.29		0.19	0.37		0.16	0.27		0.08	0.19	
Clearance Time (s)	4.5	4.5		4.5	4.5		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	2.5		3.0	2.7	
Lane Grp Cap (vph)	210	979		338	669		289	910		133	633	
v/s Ratio Prot	0.07	0.22		c0.15	c0.32		c0.12	0.11		0.04	c0.13	
v/s Ratio Perm												
v/c Ratio	0.60	0.75		0.77	0.88		0.71	0.40		0.56	0.69	
Uniform Delay, d1	50.3	38.6		46.1	35.7		47.6	35.7		53.7	45.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.9	3.3		10.1	12.6		8.1	0.2		5.4	3.1	
Delay (s)	55.2	41.9		56.2	48.3		55.7	35.9		59.1	48.9	
Level of Service	E	D		E	D		E	D		E	D	
Approach Delay (s)		43.7			50.7			42.3			50.3	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	46.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 16: 32nd Ave & Evergreen Rd

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	251	484	0	0	487	13	0	0	0	20	0	260
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)	279	538	0	0	541	14	0	0	0	22	0	289
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)		1052										
pX, platoon unblocked				0.83			0.83	0.83	0.83	0.83	0.83	
vC, conflicting volume	556			538			1933	1651	538	1644	1644	548
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	556			337			2023	1683	337	1674	1674	548
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 %	73			100			100	100	100	55	100	46
cM capacity (veh/h)	1015			1011			13	57	583	49	57	536
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2						
Volume Total	279	538	556	0	22	289						
Volume Left	279	0	0	0	22	0						
Volume Right	0	0	14	0	0	289						
cSH	1015	1700	1011	1700	49	536						
Volume to Capacity	0.27	0.32	0.00	0.00	0.45	0.54						
Queue Length 95th (ft)	28	0	0	0	41	80						
Control Delay (s)	9.9	0.0	0.0	0.0	127.4	19.3						
Lane LOS	A			A	F	C						
Approach Delay (s)	3.4		0.0	0.0	27.0							
Approach LOS				A	D							
Intersection Summary												
Average Delay			6.6									
Intersection Capacity Utilization			78.0%		ICU Level of Service					D		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 17: Sullivan Rd & 32nd Ave

2040 PM W- Proj.
 10/10/2015



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	347	20	29	63	116	434
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	381	22	32	69	127	477
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	260	127	604			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	260	127	604			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	46	98	97			
cM capacity (veh/h)	705	923	973			
Direction, Lane #	EB 1	NB 1	SB 1	SB 2		
Volume Total	403	101	127	477		
Volume Left	381	32	0	0		
Volume Right	22	0	0	477		
cSH	714	973	1700	1700		
Volume to Capacity	0.57	0.03	0.07	0.28		
Queue Length 95th (ft)	89	3	0	0		
Control Delay (s)	16.4	3.0	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	16.4	3.0	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay			6.2			
Intersection Capacity Utilization			38.7%	ICU Level of Service		A
Analysis Period (min)			15			