

City of Prince George

Prince George Golf and Curling Club Land Traffic Study



Source: Prince George Golf and Curling Club



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Prepared by:

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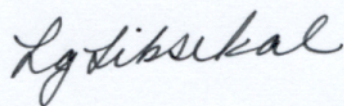
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1. Introduction

1.1 Study Purpose and Background

The City of Prince George is examining the potential redevelopment of the lands currently utilized by the Prince George Golf and Curling Club Lands (PGGCC lands) and the surrounding areas under its jurisdiction. As such, the City requires a Traffic Impact Study to be undertaken, which will determine the traffic impacts associated with the development potential of the site. The proposed redevelopment of the PGGCC lands is anticipated to house a variety of land uses including residential, commercial and recreational and park amenities. The City along with its Consultant team has prepared a refined concept plan for the PGGCC Neighbourhood Plan, dated August 21, 2008. This traffic impact study provides analysis of the potential traffic impacts arising from the refined concept plan.

1.2 Site Location and Study Area

The PGGCC and surrounding lands are currently located south of Highway 97 between Westwood Drive and Highway 16. The site currently encompasses the Pine Centre Mall, Prince George Golf & Curling Club, Roll-A-Dome, Prince George Playhouse and Pine Valley Golf Course.

The project study area, illustrated in Figure 1.1, is generally bounded by Highway 97 to the north, Highway 16 to the east, Range Road to the south and Westwood Drive to the west. The study intersections include the intersections noted below. The number beside the intersection name corresponds to the location numbers on Figure 1.1.

1. Highway 16 and Highway 97
2. Highway 16 and Playhouse Access
3. Highway 16 and Ferry Avenue
4. Highway 16 and Range Road
5. Westwood Drive and Massey Drive
6. Westwood Drive and Ferry Avenue
7. Westwood Drive and Range Road
8. Massey Drive and Pine Centre Frontage
9. Highway 97 Ramps and Pine Centre Frontage
10. Rec Place Drive and Ferry Avenue
11. Wiebe Road and Range Road

With the ultimate development of the site, the following intersections will be important access points, and are included in the study for future ultimate conditions:

- Highway 97 On-ramp and Off-ramp
- Westwood Drive and Athlone Avenue
- Westwood Drive and Fairview Crescent

-
- Westwood Drive and Laurel Crescent
 - Anthem Access and Ferry Avenue
 - Ryan Road and Ferry Avenue

1.3 Study Scope

This study evaluated the impact of the traffic generated by proposed PGGCC Neighbourhood Plan concept on the adjacent local street network, including the level of service (LOS) at each of the study intersections. The study included the following:

- Determination of the existing traffic at the eleven intersections within the study area
- Proposed trip generation for the PGGCC Neighbourhood Plan lands
- Background traffic forecasts
- Intersection analysis

1.4 Horizon Years and Peak Periods

At the request of the City of Prince George, two horizon years were analyzed.

- Horizon Year #1: 2008 – representing the existing baseline.
- Horizon Year #2: 2023 – fifteen years with full build-out of the site

An analysis of existing traffic patterns and volumes at each of the study intersections indicated that for the adjacent streets the peak hour traffic generation occurs during the weekday morning or afternoon peak hour. Given the proximity of the Pine Centre Mall and proposed commercial developments, the Saturday midday peak hour was also analyzed as peak trip generation for such land uses occur during this period. Consequently, the weekday AM and PM peak hours, as well as the Saturday midday peak hour were used as the analysis time frames.

Figure 1.1 - Project Study Area



2. Proposed Development

The proposed neighbourhood plan, while preliminary in nature and scope, provides a concept of appropriate land use and development for this key property within the City of Prince George. The proposed concept:

“recognizes the important historical role these lands played in the development of our community, as well as the existing economic, environmental and social issues that are driving the present redevelopment. For example, the plan reflects the important role recreation and green space has in our community by including an affordable and accessible 18 hole, par three golf course within the plan boundaries.”

Source: City of Prince George Website on Pine Centre Golf Course Neighbourhood Plan (June 2008)

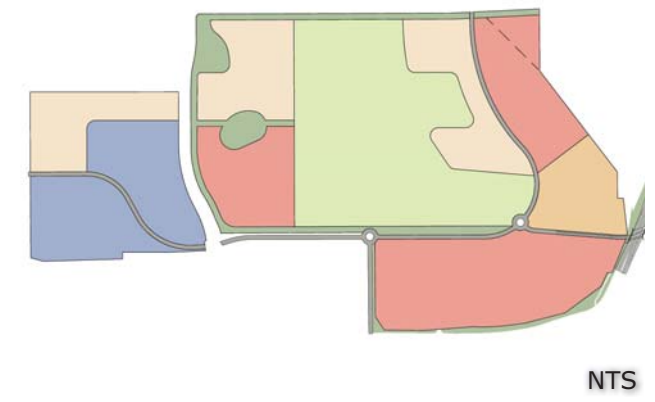
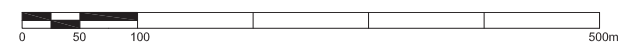
The concept proposes a mix of land uses for the area including residential, commercial, recreational and park/public space uses. Specifically, the proposed land uses are identified in Table 2.1.

Table 2.1: Proposed Land Use Concept

Proposed Land Use	Area (Ac)	Area (Ha)
Commercial		
Prince Centre Mall Expansion	11	4.4
Regional Commercial	42	17.0
Highway Commercial	27	10.9
Residential		
Medium Density Residential (Town Homes and Apartments)	36	14.6
Recreational and Park Space		
New Public Par 3 Executive Golf Course and Driving Range	51	20.6
Golf Course Clubhouse/Curling Rink/Tennis Courts	10	4.0
Linear Park/ Open Space	To Be Determined	

Development of the site is anticipated in the medium to longer term, with full build out expected within the fifteen year horizon period.

With the full development of the site, access to the PGGCC lands will be provided via existing intersections of Rec Place Drive and Ferry Avenue, and Highway 16 and Playhouse Access (consolidated). Additional site accesses will be provided via the intersections of Wiebe Road and Range Road, Ryan Road and Ferry Avenue, Westwood Drive at Athlone Avenue, at Fairview Crescent, and at Laurel Crescent. It is expected that the intersection of Highway 16 and Playhouse Access will be relocated further south and reconfigured to permit right-in/right-out movements only from the site, as well as a northbound left turn in from Highway 16. However, for ease of reference, we have retained this name at this intersection to reduce confusion that may arise with the use of the name Rec Place Drive for both the connection to Ferry Avenue and Highway 16. Figure 2.1 illustrates the PGGCC Neighbourhood Plan and the proposed site accesses.



LEGEND

	Overall Site Area	193.35 Ac. (78.25 Ha.)
	New Public Par 3 Executive Golf Course and Driving Range	51 Ac. (20.6 Ha.)
	Golf Course Clubhouse (Includes Curling Rink, Tennis Courts and Associated Parking)	10 Ac. (4.0 Ha.)
	Regional Commercial	53 Ac. (21.4 Ha.)
	Highway Commercial	27 Ac. (10.9 Ha.)
	Medium Density Residential	36 Ac. (14.6 Ha.)
	Town Homes (75%): 20-40 Units / Ha.	
	Apartments: (25%): 30-90 Units / Ha.	
	Linear Park / Open Space	T.B.D.
	Existing Pedestrian Trail Connections	

P.G.G.C.C. NEIGHBOURHOOD PLAN

August 21, 2008



Development Consulting Group McElhanney

REFINED CONCEPT - DRAFT



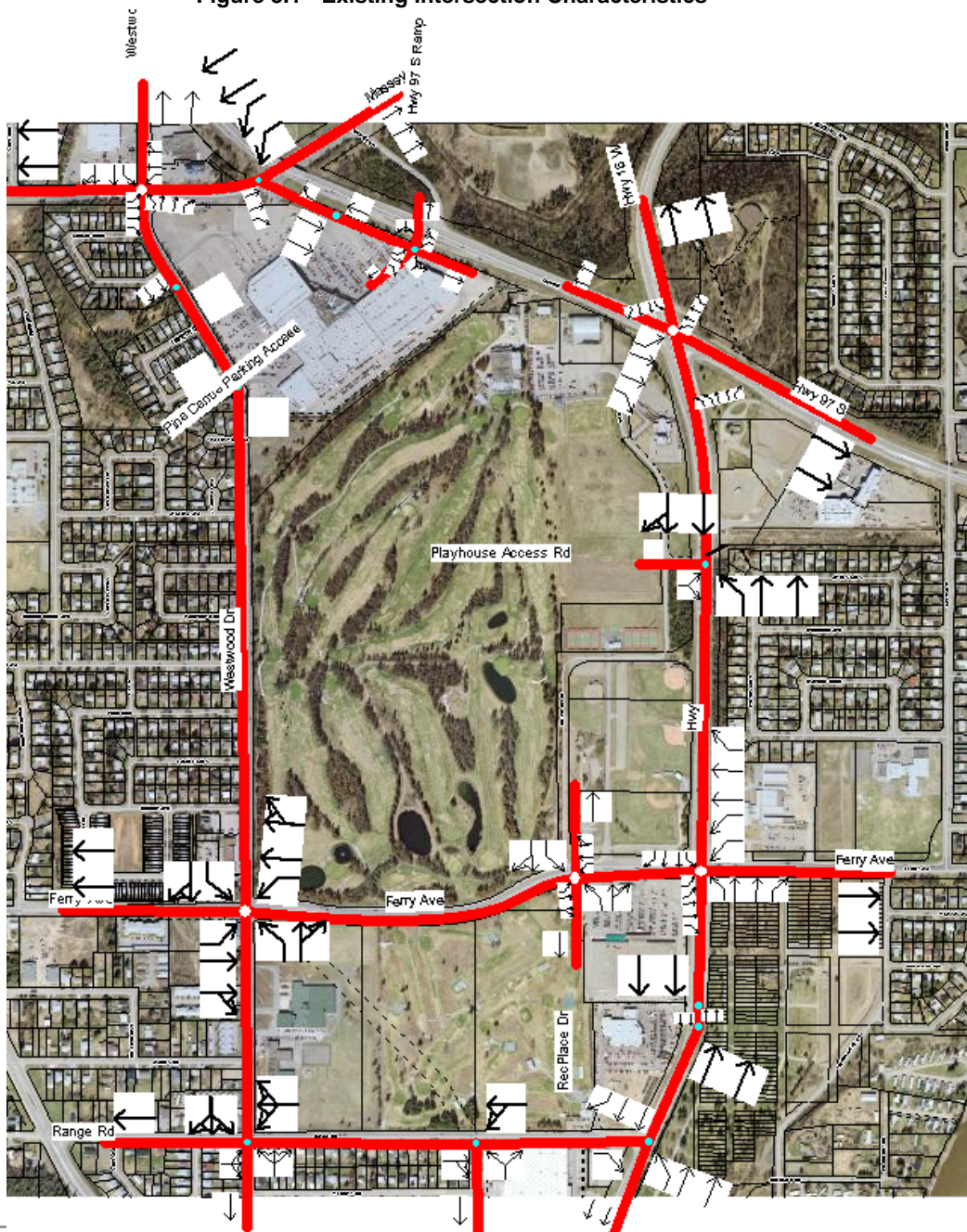
3. Existing Conditions

This section provides an overview of existing conditions within the study area.

3.1 Existing Road Network

The road network in the study area is comprised of Highway 97, Highway 16, Massey Drive, Westwood Drive, Ferry Avenue, Range Road, Wiebe Road, Playhouse Access Road and Pine Centre Frontage Road, with existing intersection laning characteristics illustrated in Figure 3.1.

Figure 3.1 - Existing Intersection Characteristics



Within the study area, Highway 16 is a four-lane, two-way highway with a posted speed of 60 km/h. Auxiliary turn lanes are provided at the intersections with Highway 97, Place House Access, Ferry Avenue and Range Road. Westwood Drive is a two-lane collector road, with a posted speed of 50 km/h. This facility also includes a two-way left turn lane, permitting access to development on either side of the road.

Ferry Avenue and Massey Drive are four lane arterial facilities with posted speeds of 50 km/h, with turn lanes provided at Ferry Avenue and Highway 16, Rec Place Drive and Westwood Drives. Within the study area, Massey Drive has turn lanes at Pine Frontage Road, and at Westwood Drive.

Range Road is a two-lane collector facility, with a posted speed of 50 km/h and no auxiliary turn lanes. Similarly, Wiebe Road is a two-lane road with a posted speed of 50 km/h and no dedicated turn lanes.

The Playhouse Access Road is a two lane local road providing access to the Prince George Playhouse. The Pine Centre Frontage Road is a two-lane facility, which provides access the Pine Centre Mall and connects to the Highway 97 on-ramps. It also connects to Massey Drive at an unsignalized T-intersection.

Highway 97, a major provincial highway that is oriented east west through this part of the city, is a four-lane, two-way urban highway with a posted speed of 60 km/h. Dedicated left and right turn lanes are provided at the intersection with Highway 16.

Within the study area, five existing intersections are signalized Highway 16 and Highway 97, Highway 16 and Ferry Avenue, Westwood Drive and Massey Drive, Massey Drive and Ferry Avenue and Ferry Avenue and Rec Place Drive at the future Wiebe Road extension. The remaining intersections in the study area are currently unsignalized two-way stop control or yield control intersections.

3.2 Existing Traffic Volumes

UMA commissioned intersection traffic counts for all study intersections, which are documented in Appendix I. Given the number of locations and the desire to count both the weekday and weekend condition, the count program was conducted between March 15 and April 8, 2008.

3.3 Existing Level of Service

Existing conditions for 2008 were assessed in Synchro Sim Traffic to provide a baseline from which the future results could be compared, and are illustrated in Tables 3.1 through 3.3 for the optimized condition. Detailed results and Synchro reports are included in Appendix II. In the morning peak hour, results of the initial analysis (without improvements) indicate that all intersections operate well without significant average delays for the intersection as a whole, and LOS "C" or better for all movements, with the following exceptions:

- North and southbound left turn movement at Highway 16 and Highway 97

- Eastbound left, eastbound through and westbound left turn movements at Highway 16 and Ferry Avenue

With signal timing optimization, conditions improve at both intersections except for eastbound through and left turn movements at Highway 16 and Ferry Avenue, which continues to experience longer delays than other locations.

Similarly, during the afternoon peak hour under existing conditions, all intersections continue to operate well with nominal average delays for the intersection as a whole except at the intersections of Highways 16 and 97 and at Highway 16 and Ferry Avenue. All movements operate at LOS “C” or better with the following exceptions:

- Eastbound right, northbound approach and southbound left and through movements at the intersection of Highways 16 and 97
- Outbound movements at Highway 16 and Playhouse access
- Westbound left, westbound through and southbound through movements at Highway 16 and Ferry Avenue.

Signal timing modifications at the two signalized intersections improves conditions with the intersection of Highways 16 and 97, operating at LOS “C” (Table 3.2). While delays decrease for movements and the intersection as a whole, some movements continue to experience LOS less than LOS “C”. At Highway 16 and Ferry Avenue, signal timing optimization results in nominal improvements to the intersection; however, the eastbound approach, and westbound left and southbound through movements continue to experience delays. At the unsignalized Playhouse access, the heavy flows on Highway 16 do not appear to provide sufficient gaps to allow vehicles entry onto Highway 16 without significant delay. With the anticipated future relocation of this intersection further south, and reconfiguration to prohibit outbound left turn movements, there may be opportunity to improve operations.

Results of the analysis for the Saturday peak hour under existing conditions indicate that all intersections operate well, with nominal average delays for the intersection as a whole, and LOS “C” or better for all except the Highway 16 and Highway 97 intersection. When examined by movement, all movements operate at LOS “C” or better, with the following exceptions:

- Eastbound right, and north and southbound left and through movements at the intersection of Highways 16 and 97
- Outbound movements at Highway 16 and Playhouse access
- Eastbound approach and westbound left turn movement at Highway 16 and Ferry Avenue

At the intersection of Highway 16 and 97, signal timing modifications (illustrated in Table 3.3), improve the LOS of all movements and the intersection as a whole improve to LOS “C”. At Ferry Avenue and Highway 16, signal timing optimization improves conditions nominally, but the same movements continue to experience delays. As noted above, the current configuration of the Playhouse access of Highway 16 experiences difficulty, but is anticipated to improve with the reconfiguration to prohibit outbound left turns.

Table 3.1: Level of Service (LOS) Existing Conditions – AM Peak Hour

ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		16	550	293	63	462	76	468	429	70	92	155	18		
	V/C Ratio		0.1	0.6	0.3	0.3	0.4	0.1	0.6	0.5	0.2	0.4	0.3	0.1		
	Q-length (m) (95%)		5.8	67.6	8.8	16.0	56.2	9.5	65.8	58.8	10.3	34.0	25.1	5.9		
	Delay (s)		18.4	25.7	9.6	17.0	22.5	19.1	31.8	26.3	22.8	34.6	30.2	28.6		
	LOS		B	C	A	B	C	B	C	C	C	C	C	C		
	Approach Delay (s)			20.1			21.5			28.7			31.6			
	Approach LOS			C			C			C			C		24.6	C
2	Hwy 16 & Playhouse Access	Unsig														
	Volume (vph)		4		4				4	1229			502	15		
	V/C Ratio		0.0		0.0				0.0	0.4			0.2	0.1		
	Q-length (m) (95%)		0.9		0.9				0.1	0.0			0.0	0.1		
	Delay (s)		20.8		20.8				8.7	0.0			0.0	0.0		
	LOS		C		C				A	A			A	A		
	Approach Delay (s)			20.8					0.0				0.0			
	Approach LOS			C					A				A		0.1	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		58	195	51	317	165	63	104	1235	552	49	341	37		
	V/C Ratio		0.2	0.4	0.2	0.7	0.2	0.1	0.2	0.8	0.5	0.2	0.2	0.1		
	Q-length (m) (95%)		11.2	27.5	9.9	43.8	22.2	10.1	16.4	#141.5	18.2	9.0	31.0	5.6		
	Delay (s)		39.9	35.2	32.8	34.0	25.7	24.6	11.0	26.0	16.3	17.3	16.4	14.7		
	LOS		D	D	C	C	C	C	B	C	B	B	B	B		
	Approach Delay (s)			35.7			30.4			22.3			16.4			
	Approach LOS			D			C			C			B		24.2	C
4	Hwy 16 & Range	Unsig														
	Volume (vph)				39				66	1680			624	39		
	V/C Ratio				0.1				0.1	0.5			0.2	0		
	Q-length (m) (95%)				1.5				1.9	0.0			0.0	0.0		
	Delay (s)				10.7				9.2	0.0			0.0	0.0		
	LOS				B				A	A			A	A		
	Approach Delay (s)			10.7						0.3			0.0			
	Approach LOS			B						A			A		0.4	A

ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS	
5	Westwood & Massey	Sig															
	Volume (vph)		27	371	61	52	214	9	128	98	177	98	124	50			
	V/C Ratio		0.1	0.3	0.1	0.1	0.2	0.2	0.3	0.1	0.3	0.2	0.3	0.3			
	Q-length (m) (95%)		6.3	37.3	8.4	10.3	22.6	22.6	23.2	12.9	14.8	18.5	17.8	17.8			
	Delay (s)		11.3	15.6	13.9	9.7	13.6	13.6	16.4	22.5	22.4	20.4	25.5	25.5			
	LOS		B	B	B	A	B	B	B	C	C	C	C	C			
	Approach Delay (s)			15.1			12.9			20.5			23.7				
	Approach LOS			B			B			C			C			17.9	B
6	Westwood & Ferry	Sig															
	Volume (vph)		28	143	65	53	84	133	44	233	72	72	121	6			
	V/C Ratio		0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.5	0.5	0.2	0.1	0.1			
	Q-length (m) (95%)		8.5	15.1	15.1	13.7	11.5	11.5	9.1	44.5	44.5	7.5	11.4	11.4			
	Delay (s)		10.6	10.8	10.8	11.0	10.7	10.7	12.4	16.8	16.8	7.7	6.8	6.8			
	LOS		B	B	B	B	B	B	B	B	B	A	A	A			
	Approach Delay (s)			10.8			10.7			16.2			7.1				
	Approach LOS			B			B			B			A			11.9	B
7	Westwood & Range	Unsig															
	Volume (vph)		58	39	33	1	25	71	32	105	1	26	50	13			
	V/C Ratio		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1			
	Q-length (m) (95%)																
	Delay (s)		7.8	7.8	7.8	7.4	7.4	7.4	7.9	7.9	7.9	7.8	7.8	7.8			
	LOS		A	A	A	A	A	A	A	A	A	A	A	A			
	Approach Delay (s)			7.8			7.4			7.9			7.8				
	Approach LOS			A			A			A			A			7.8	A
8	Massey & Pine Centre Frontage	Unsig															
	Volume (vph)			518	57	88	240				27						
	V/C Ratio			0.2	0.0	0.1	0.1				0.1						
	Q-length (m) (95%)			0.0	0.0	3.0	0.0				1.2						
	Delay (s)			0.0	0.0	9.3	0.0				10.6						
	LOS			A	A	A	A				B						
	Approach Delay (s)			0.0			2.5			10.6							
	Approach LOS			A			A			B						1.2	A

ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
9	Hwy 97 Ramps & Pine Centre Frontage	Unsig														
	Volume (vph)		74	12	0	0	6	4	3	7	3	11	20	4		
	V/C Ratio		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1		
	Q-length (m) (95%)															
	Delay (s)		7.2	6.5	5.0	6.5	6.2	6.2	7.2	7.2	7.2	7.4	7.4	7.4		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			7.1			6.2			7.2			7.4			
Approach LOS			A			A			A			A		7.1	A	
10	Rec Place & Ferry	Sig														
	Volume (vph)		30	258	56	77	219	3	23	1	2	25	1	11		
	V/C Ratio		0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0		
	Q-length (m) (95%)		3.0	17.4	17.4	5.8	13.2	13.2	6.0	1.4	1.4	6.3	2.9	2.9		
	Delay (s)		3.0	5.1	5.1	2.9	4.7	4.7	24.6	23.4	23.4	24.7	23.4	23.4		
	LOS		A	A	A	A	A	A	C	C	C	C	C	C		
	Approach Delay (s)			4.9			4.2			24.5			24.3			
Approach LOS			A			A			C			C		6.3	A	
11	Wiebe & Range	Unsig														
	Volume (vph)			49	21	21	90		17		5					
	V/C Ratio			0.1	0.1	0.0	0.0		0.0		0.0					
	Q-length (m) (95%)			0.0	0.0	0.4	0.4		0.8		0.8					
	Delay (s)			0.0	0.0	1.5	1.5		9.8		9.8					
	LOS			A	A	A	A		A		A					
	Approach Delay (s)			0.0			1.5			9.8						
Approach LOS			A			A			A					1.9	A	

95th percentile volume exceeds capacity, queue may be longer. Queue shown is the maximum after two cycles.

Table 3.2: Level of Service (LOS) Existing Conditions – PM Peak Hour

ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		57	507	682	146	673	98	405	306	48	117	736	33		
	V/C Ratio		0.3	0.5	0.8	0.5	0.6	0.2	0.7	0.4	0.1	0.3	0.8	0.1		
	Q-length (m) (95%)		16.6	68.7	161.4	36.8	93.8	11.9	66.3	49.4	10.3	38.4	107.2	8.6		
	Delay (s)		24.2	31.5	25.9	24.0	32.7	25.2	45.5	34.8	31.7	33.3	36.7	26.6		
	LOS		C	C	C	C	C	C	D	C	C	C	D	C		
	Approach Delay (s)			28.1			30.5				40.3		35.9			
	Approach LOS			C			C				D		D		32.9	C
2	Hwy 16 & Playhouse Access	Unsig														
	Volume (vph)		16		6				10	774			1621	23		
	V/C Ratio		0.5		0.5				0.0	0.3			0.7	0.4		
	Q-length (m) (95%)		13.8		13.8				0.7	0.0			0.0	0.4		
	Delay (s)		136.0		136.0				15.6	0.0			0.0	0.0		
	LOS		F		F				C	A			A	A		
	Approach Delay (s)			136.0					0.2				0.0			
	Approach LOS			F					A				A		1.3	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		157	244	232	624	326	51	94	665	175	54	1194	221		
	V/C Ratio		0.5	0.4	0.7	0.9	0.4	0.1	0.5	0.5	0.2	0.2	0.9	0.3		
	Q-length (m) (95%)		29.7	38.8	55.9	#109.8	44.1	12.7	24.2	86.6	14.4	14.9	#200.8	25.2		
	Delay (s)		44.7	40.2	45.8	49.8	30.8	28.1	27.1	24.7	20.3	17.5	38.7	21.1		
	LOS		D	D	D	D	C	C	C	C	C	B	D	C		
	Approach Delay (s)			43.4			42.5			24.2			35.3			
	Approach LOS			D			D			C			D		35.8	D
4	Hwy 16 & Range	Unsig														
	Volume (vph)				84				36	928			1763	173		
	V/C Ratio				0.3				0.1	0.3			0.6	0		
	Q-length (m) (95%)				11.2				3.1	0.0			0.0	0.0		
	Delay (s)				25.7				17.9	0.0			0.0	0.0		
	LOS				D				C	A			A	A		

ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
	Approach Delay (s)			25.7						0.7			0.0			
	Approach LOS			D						A			A		0.9	A
5	Westwood & Massey	Sig														
	Volume (vph)		45	264	81	203	415	48	245	173	129	100	215	68		
	V/C Ratio		0.1	0.4	0.2	0.4	0.4	0.4	0.5	0.2	0.2	0.2	0.4	0.4		
	Q-length (m) (95%)		10.9	34.8	11.7	39.0	51.7	51.7	45.4	21.3	12.8	19.9	34.6	34.6		
	Delay (s)		19.7	25.7	23.8	14.3	21.3	21.3	14.7	20.9	20.3	20.0	27.7	27.7		
	LOS		B	C	C	B	C	C	B	C	C	C	C	C		
	Approach Delay (s)			24.6			19.2			18.0			25.7			
	Approach LOS			C			B			B			C		21.2	C
6	Westwood & Ferry	Sig														
	Volume (vph)		47	149	77	69	160	187	91	264	90	140	262	62		
	V/C Ratio		0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.6	0.6	0.3	0.3	0.3		
	Q-length (m) (95%)		14.4	17.3	17.3	19.0	19.0	19.0	19.4	61.4	61.4	15.5	32.7	32.7		
	Delay (s)		16.7	15.9	15.9	16.8	16.1	16.1	12.4	15.2	15.2	6.7	5.8	5.8		
	LOS		B	B	B	B	B	B	B	B	B	A	A	A		
	Approach Delay (s)			16.0			16.2			14.6			6.1			
	Approach LOS			B			B			B			A		12.8	B
7	Westwood & Range	Unsig														
	Volume (vph)		17	70	87	2	99	147	48	96	5	94	201	30		
	V/C Ratio		0.4	0.4	0.4	0.6	0.6	0.6	0.4	0.4	0.4	0.7	0.7	0.7		
	Q-length (m) (95%)															
	Delay (s)		9.7	9.7	9.7	9.4	9.4	9.4	9.9	9.9	9.9	11.2	11.2	11.2		
	LOS		A	A	A	A	A	A	A	A	A	B	B	B		
	Approach Delay (s)			9.7			9.4			9.9			11.2			
	Approach LOS			A			A			A			B		10.2	B
8	Massey & Pine Centre Frontage	Unsig														
	Volume (vph)			488	93	354	481				164					
	V/C Ratio			0.2	0.1	0.4	0.2				0.3					
	Q-length (m) (95%)			0.0	0.0	17.1	0.0				9.1					
	Delay (s)			0.0	0.0	11.5	0.0				12.4					
	LOS			A	A	B	A				B					

ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
	Approach Delay (s)			0.0			4.9			12.4						
	Approach LOS			A			A			B					3.9	A
9	Hwy 97 Ramps & Pine Centre Frontage	Unsig														
	Volume (vph)		150	40	1	8	35	25	18	60	6	21	65	23		
	V/C Ratio		0.3	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2		
	Q-length (m) (95%)															
	Delay (s)		7.9	7.0	5.0	7.4	6.8	6.8	8.0	8.0	8.0	7.9	7.9	7.9		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			7.7			6.9			8.0			7.9			
	Approach LOS			A			A			A			A		7.7	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		51	228	153	265	263	6	142	14	21	66	10	33		
	V/C Ratio		0.1	0.4	0.4	0.4	0.2	0.2	0.4	0.1	0.1	0.2	0.1	0.1		
	Q-length (m) (95%)		6.9	23.2	23.2	28.7	20.9	20.9	28.8	6.9	6.9	14.9	7.1	7.1		
	Delay (s)		9.0	13.1	13.1	5.3	8.7	8.7	20.3	16.6	16.6	17.7	16.6	16.6		
	LOS		A	B	B	A	A	A	C	B	B	B	B	B		
	Approach Delay (s)			12.6			7.0			19.6			17.3			
	Approach LOS			B			A			B			B		11.6	B
11	Wiebe & Range	Unsig														
	Volume (vph)			87	73	44	136		114		10					
	V/C Ratio			0.1	0.1	0.0	0.0		0.2		0.2					
	Q-length (m) (95%)			0.0	0.0	0.8	0.8		6.3		6.3					
	Delay (s)			0.0	0.0	2.1	2.1		12.4		12.4					
	LOS			A	A	A	A		B		B					
	Approach Delay (s)			0.0			2.1			12.4						
	Approach LOS			A			A			B					4.1	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is the maximum after two cycles.

Table 3.3: Level of Service (LOS) Existing Conditions – Saturday Peak Hour

Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
Hwy 16 & Hwy 97	Sig														
Volume (vph)		71	387	810	112	400	59	522	373	27	73	442	46		
V/C Ratio		0.3	0.5	0.8	0.4	0.5	0.1	0.6	0.4	0.1	0.2	0.6	0.1		
Q-length (m) (95%)		20.8	54.0	187.5	30.2	56.0	9.3	77.2	56.4	7.1	25.2	63.8	8.6		
Delay (s)		23.8	30.7	26.0	25.0	31.1	26.5	31.7	27.7	24.4	27.9	30.7	25.9		
LOS		C	C	C	C	C	C	C	C	C	C	C	C		
Approach Delay (s)			27.3			29.4			29.8			29.9			
Approach LOS			C			C			C			C		28.8	C
Hwy 16 & Playhouse Access	Unsig														
Volume (vph)		25		29				14	1032			1286	43		
V/C Ratio		0.6		0.6				0.0	0.3			0.5	0.3		
Q-length (m) (95%)		21.3		21.3				0.7	0.0			0.0	0.3		
Delay (s)		85.3		85.3				12.7	0.0			0.0	0.0		
LOS		F		F				B	A			A	A		
Approach Delay (s)			85.3					0.2				0.0			
Approach LOS			F					A				A		2.0	A
Hwy 16 & Ferry	Sig														
Volume (vph)		123	171	118	263	176	34	208	779	213	39	871	203		
V/C Ratio		0.4	0.4	0.4	0.6	0.3	0.1	0.7	0.5	0.2	0.2	0.7	0.3		
Q-length (m) (95%)		19.6	25.1	14.3	37.1	25.1	7.8	#50.5	73.7	11.9	7.5	95.2	13.2		
Delay (s)		38.1	35.6	33.8	35.2	30.9	29.0	19.2	16.7	13.3	14.4	24.8	17.7		
LOS		D	D	C	D	C	C	B	B	B	B	C	B		
Approach Delay (s)			35.8			33.2			16.5			23.1			
Approach LOS			D			C			B			C		23.8	C
Hwy 16 & Range	Unsig														
Volume (vph)				76				39	979			908	243		
V/C Ratio				0.2				0.1	0.3			0.3	0		
Q-length (m) (95%)				4.4				1.6	0.0			0.0	0.0		
Delay (s)				13.3				10.7	0.0			0.0	0.0		
LOS				B				B	A			A	A		

Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
Approach Delay (s)			13.3						0.4			0.0			
Approach LOS			B						A			A		0.6	A
Westwood & Massey	Sig														
Volume (vph)		56	307	55	76	180	23	274	179	149	166	282	57		
V/C Ratio		0.2	0.5	0.2	0.3	0.3	0.3	0.7	0.2	0.3	0.5	0.6	0.6		
Q-length (m) (95%)		13.4	39.2	6.3	17.1	24.9	24.9	52.7	21.9	11.5	31.5	41.0	41.0		
Delay (s)		19.1	27.8	24.2	18.7	25.5	25.5	17.7	18.7	18.4	19.0	26.4	26.4		
LOS		B	C	C	B	C	C	B	B	B	B	C	C		
Approach Delay (s)			26.2			23.6			18.2			24.0			
Approach LOS			C			C			B			C		22.5	C
Westwood & Ferry	Sig														
Volume (vph)		41	132	9	59	147	276	16	331	128	194	238	28		
V/C Ratio		0.2	0.2	0.2	0.2	0.4	0.4	0.0	0.6	0.6	0.4	0.2	0.2		
Q-length (m) (95%)		11.5	12.9	12.9	14.3	17.7	17.7	4.2	66.5	66.5	16.6	20.9	20.9		
Delay (s)		16.3	15.4	15.4	15.9	16.0	16.0	9.7	14.7	14.7	6.8	4.8	4.8		
LOS		B	B	B	B	B	B	A	B	B	A	A	A		
Approach Delay (s)			15.6			16.0			14.6			5.7			
Approach LOS			B			B			B			A		12.5	B
Westwood & Range	Unsig														
Volume (vph)		25	109	63	2	92	339	76	155	2	130	125	7		
V/C Ratio		0.4	0.4	0.4	0.8	0.8	0.8	0.5	0.5	0.5	0.5	0.5	0.5		
Q-length (m) (95%)															
Delay (s)		10.2	10.2	10.2	13.2	13.2	13.2	10.9	10.9	10.9	11.1	11.1	11.1		
LOS		B	B	B	B	B	B	B	B	B	B	B	B		
Approach Delay (s)			10.2			13.2			10.9			11.1			
Approach LOS			B			B			B			B		11.7	B
Massey & Pine Centre Frontage	Unsig														
Volume (vph)			505	140	460	336				246					
V/C Ratio			0.2	0.1	0.5	0.1				0.4					
Q-length (m) (95%)			0.0	0.0	20.6	0.0				12.8					
Delay (s)			0.0	0.0	11.7	0.0				12.8					
LOS			A	A	B	A				B					

Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
Approach Delay (s)			0.0			6.8			12.8						
Approach LOS			A			A			B					5.1	A
Hwy 97 Ramps & Pine Centre Frontage	Unsig														
Volume (vph)		245	62	11	20	46	27	29	108	16	41	110	24		
V/C Ratio		0.5	0.1	0.0	0.0	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3		
Q-length (m) (95%)															
Delay (s)		9.1	7.5	5.0	8.0	7.3	7.3	8.8	8.8	8.8	8.8	8.8	8.8		
LOS		A	A	A	A	A	A	A	A	A	A	A	A		
Approach Delay (s)			8.6			7.5			8.8			8.8			
Approach LOS			A			A			A			A		8.5	A
Rec Place & Ferry	Sig														
Volume (vph)		81	218	200	337	279	22	175	19	23	80	17	106		
V/C Ratio		0.2	0.5	0.5	0.7	0.3	0.3	0.6	0.1	0.1	0.2	0.3	0.3		
Q-length (m) (95%)		12.1	20.2	20.2	#52.9	26.6	26.6	32.6	6.4	6.4	15.5	8.2	8.2		
Delay (s)		9.8	15.6	15.6	11.7	11.9	11.9	22.7	15.1	15.1	16.4	15.4	15.4		
LOS		A	B	B	B	B	B	C	B	B	B	B	B		
Approach Delay (s)			14.6			11.8			21.2			15.8			
Approach LOS			B			B			C			B		14.5	B
Wiebe & Range	Unsig														
Volume (vph)			107	149	22	207		249		25					
V/C Ratio			0.2	0.2	0.0	0.0		0.6		0.6					
Q-length (m) (95%)			0.0	0.0	0.5	0.5		32.5		32.5					
Delay (s)			0.0	0.0	0.9	0.9		22.8		22.8					
LOS			A	A	A	A		C		C					
Approach Delay (s)			0.0			0.9			22.8						
Approach LOS			A			A			C					8.5	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is the maximum after two cycles.

4. Projected Traffic

This section provides an overview of the forecast traffic with and without the redevelopment of the PGGCC lands.

4.1 Background Traffic

Background traffic volumes, representing the growth in traffic that is expected to occur within the forecast horizon, were established based on traffic counts for the AM, PM and Saturday peak hour traffic counts and growth factors. Historically, long term growth factors were established based on 10 to 20 years of data and have values that range between 2% and 3% for urban areas. In recent work for the City, it has been suggested that 1.5% is an appropriate growth factor for the City of Prince George, which was used to forecast growth in background traffic. Summaries of background traffic volumes are included in Appendix I.

4.2 Development Traffic

4.2.1 Trip Generation

The mixed nature of the land use plan concept was taken into account during the calculation of the trips generated. Trips from each distinct land use within the study area were considered independently.

The assumed land area dedicated to each land use and development densities were obtained from drawings provided by Site 360 Consulting Inc. dated August 21, 2008. Table 4.1 summarizes the development statistics for each type of land use proposed for the PGGCC lands. Further clarification on the land uses was provided by P. Rinn of Site 360 Consulting Inc., P. Ardagh of Development Consulting Group Ltd., and the City of Prince George.

One development scenario and land use pattern was developed for analysis representing full build-out of the plan area, which is anticipated to occur within the fifteen year horizon period. The trip generation was calculated based on the land use, density, site coverage and unit information provided and ITE Trip Generation manual rates.¹ As the proposed curling rinks represents a facility for which standard trip generation rates from the ITE manual do not accurately address the land use type, the trips listed in Table 4.1 were based on discussions and approvals from the City of Prince George. Given the large and multi use nature of the site, an overall 10% trip reduction was incorporated to reflect internal trips, trip chaining, as well as non-vehicular trip opportunities. Trip Generation by area and land use type is summarized in Table 4.2 for the AM, PM and Saturday Peak Hours.

¹ "Trip Generation" 7th Edition, Institute of Transportation Engineers, 2003

Table 4.1: Land Use

Commercial Land Uses				
Land Use Type	Land Area (Size)	Site Coverage (%)		Value of Independent Variable for Trip Generation
1 Pine Centre Mall Expansion	10 acres			110,000 GLA (ft ²)
2 Regional Commercial	RC2 (west of Highway 16)			
	30 acres	0.3		392,040 GLA (ft ²)
	RC3 (north of Ferry Ave)			
	12 acres	0.3		156,816 GLA (ft ²)
	RC3 (Anthem)			
	8.7 acres	0.3		113,667 GLA (ft ²)
	Total			662,523 GLA (ft ²)
3 Hotel & 2 Restaurants (Anthem) ¹	Sandman Hotel			124 Occupied Rooms
	Two Restaurants			360 Seats
4 Highway Commercial	27 acres	0.3		352,836 GLA (ft ²)
Residential Land Uses				
Land Use Type	Land Area (Size)	Site Coverage (%)	Zoning	Value of Independent Variable for Trip Generation
6 Med Density Residential ³	MDR1 (at Athlone Ave)			
	13 acres		RM3	158 Dwelling Units
			RM4	118 Dwelling Units
	MDR2 (at Ferry Ave & Westwood Dr)			
	12 acres		RM3	146 Dwelling Units
			RM4	109 Dwelling Units
	MDR3 (at Range Rd & Wiebe Rd)			
	11 acres		RM3	134 Dwelling Units
		RM4	100 Dwelling Units	
	Total			765 Dwelling Units
Recreational Land Uses				
Land Use Type	Land Area (Size)	Facility		Value of Independent Variable for Trip Generation
7 Curling Rink	8 acres			
		Curling Rink ⁴	8 sheets	150 Trips

Notes:

Based on PGGCC Neighborhood Plan provided by Site 360, August 21, 2008. Additional information & clarification on sizing, zoning, site coverage, densities and floor area provided by P. Rinn, P. Ardagh, G. Stanker and D. Milburn

¹ Hotel Occupancy in Prince George 2007 was an average of 68.8% that peaked at 75.5% in the 2nd quarter including beginning of summer months. Source: Tourism BC Research Services "Tourism Indicators - Data Tables May 2008"

² Based on RM3 zoning, with associated densities of 40 du/ha

³ Based on RM4 zoning, with associated densities of 90 du/ha

⁴ The size of the curling rink was based on discussions with G. Stanker, 20 June 2008.

Table 4.2: Full Development Trip Generation (veh/h)

Areas	Time Frame	Trip Generation	In	Out
Pine Mall Expansion (RC1)	AM PK Hr	45	27	19
	PM PK Hr	219	105	114
	Saturday	293	152	140
Regional Commercial (RC2)	AM PK Hr	259	158	101
	PM PK Hr	1161	557	604
	Saturday	1576	819	756
Regional Commercial (RC3)	AM PK Hr	104	63	40
	PM PK Hr	465	223	242
	Saturday	630	328	303
Regional Commercial (Anthem)	AM PK Hr	75	46	29
	PM PK Hr	337	162	175
	Saturday	457	238	219
Hotel (Anthem)	AM PK Hr	75	43	31
	PM PK Hr	78	38	40
	Saturday	97	48	48
2 Restaurants (Anthem)	AM PK Hr	152	79	73
	PM PK Hr	136	79	57
	Saturday	266	146	120
Highway Commercial (HC1)	AM PK Hr	156	95	61
	PM PK Hr	671	322	349
	Saturday	917	477	440
Highway Commercial (HC2)	AM PK Hr	145	88	56
	PM PK Hr	623	299	324
	Saturday	851	443	409
Med Density Residential (MDR1)	AM PK Hr	124	21	103
	PM PK Hr	129	86	43
	Saturday	137	74	63
Med Density Residential (MDR2)	AM PK Hr	117	21	96
	PM PK Hr	121	79	42
	Saturday	132	65	67
Med Density Residential (MDR3)	AM PK Hr	111	20	91
	PM PK Hr	113	74	40
	Saturday	126	62	64
Curling Rink (GC1)	AM PK Hr	135	68	68
	PM PK Hr	135	68	68
	Saturday	135	68	68

Note: includes 10% trip reduction

4.2.2 Trip Distribution and Assignment

To determine trip distribution, Origin/Destination information from the updated City of Prince George EMME Model for the current base year (2006) was obtained. The City was divided into seven areas, which are illustrated in Figure 4.1 and defined below, with trips to and from the existing site used to define the origin-destination pairings:

- Area A – Areas north of the Nechako River
- Area B – Areas east of the Fraser River
- Area C – Areas north and east of Highway 97

- Area D – Areas east of Highway 16 between Highway 97 and Ferry Avenue
- Area E – Areas south of Ferry Avenue and east of Westwood Drive
- Area F – Areas south of 22nd Avenue and west of Westwood Drive
- Area G – Areas south of the Nechako River, west of Highway 97 and north of 22nd Avenue

Some of these areas, because of their similarity in route patterns to and from the site, were combined to simplify the trip distribution process. Thus, the following trip distribution (Table 4.3) was assumed for traffic destined to and from the aforementioned areas throughout the City.

Table 4.3: Trip Distribution

To/From	Outbound	Inbound
A & G	28%	26%
B & D	6%	11%
C	29%	31%
E	13%	8%
F	25%	25%
Total	100%	100%

Given the size and likely development pattern of the area, the distribution was iteratively assigned to the network based on proximity of the area within the site to route choices, as follows:

- Trips destined or originating in Areas A and G would likely use either Westwood Drive or Highway 16 depending on the relative proximity of their origin/destination point within the site, as well as the proposed internal connection options.
- For trips to/from Areas B and D, Ferry Avenue would be the preferred routing choice, with some trips opting to use Highway 97.
- For trips to and from Area C, the preferred routing would either be via Westwood Drive and Massey Drive, or Highway 16 depending on the relative proximity of their origin/destination point within the site, as well as the proposed internal connection options.
- Trips with origins or destinations in Area E and Area F would be likely distributed between Westwood Drive, Ferry Avenue, Range Road and Highway 16.

This distribution was used for the horizon year analyses for expected traffic movements at the study intersections, details of which are documented in Appendix I.

4.3 Combined Traffic

The traffic generated by the project site was superimposed on the horizon year background traffic volumes. The expected total peak hour traffic volumes at the intersections in the study area are shown in Tables 4.4 to 4.6, representing the three development scenarios. Details of the scenario configurations are provided in Section 5.2.

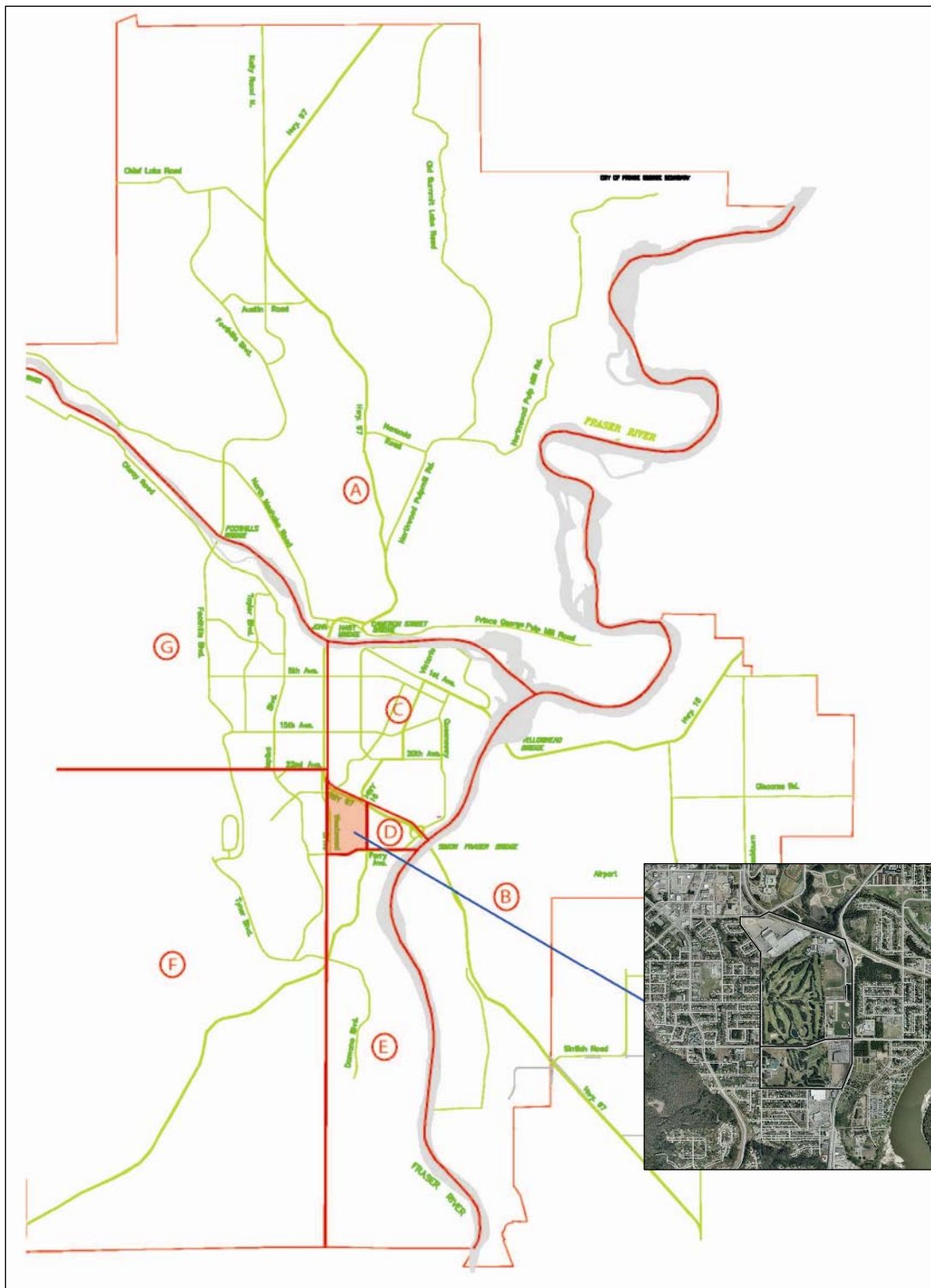


Figure 4.1 - Trip Distribution - Origin and Destination Areas

Table 4.4: 2023 Peak Hour Background + Site Development Scenario II Traffic Volumes

AM PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO II TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	590	646	88	115	414	23	20	688	474	79	578	109
2	Hwy 16 & Playhouse Access	16	1657	0	0	748	240	0	0	59	0	0	0
3	Hwy 16 & Ferry Ave	216	1555	690	69	472	166	193	277	129	396	272	79
4	Hwy 16 & Range Rd	90	2198	0	0	891	49	0	0	72	0	0	0
5	Westwood Dr & Massey Dr	220	151	276	123	190	63	34	464	144	68	268	11
6	Westwood Dr & Ferry Ave	55	300	90	112	179	21	42	247	81	66	182	211
7	Westwood Dr & Range Rd	40	140	1	40	84	16	73	58	41	1	59	89
8	Westwood Dr & Pine Centre Frontage	0	0	34	0	0	0	0	699	76	110	303	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	111	282
10	Rec Place Dr & Ferry Ave	29	65	64	130	1	45	80	381	91	211	351	64
11	Wiebe Rd & Range Rd	21	20	6	19	7	28	9	64	29	26	113	7
12	Westwood Dr & Athlone Ave	0	598	10	78	322	0	0	0	0	16	15	48
13	Anthem Access & Ferry Ave	0	0	0	0	0	32	0	599	0	0	382	53
14	Westwood Dr & Fairview Cres	0	588	3	3	335	0	0	0	0	10	0	21
15	Westwood Dr & Laurel Cres	0	561	4	3	342	0	0	0	0	18	0	31
16	Ryan Rd & Ferry Ave	18	0	30	33	0	36	17	491	14	18	405	22
PM PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO II TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	517	701	60	146	1547	41	71	634	1147	183	841	165
2	Hwy 16 & Playhouse Access	47	1317	0	0	2442	577	0	0	186	0	0	0
3	Hwy 16 & Ferry Ave	341	865	219	93	1646	691	545	399	454	780	596	64
4	Hwy 16 & Range Rd	68	1417	0	0	2521	216	0	0	181	0	0	0
5	Westwood Dr & Massey Dr	419	253	228	125	375	85	56	330	308	265	519	60
6	Westwood Dr & Ferry Ave	114	358	113	241	363	99	80	380	96	86	387	350
7	Westwood Dr & Range Rd	60	148	6	127	277	38	21	117	109	3	228	184
8	Westwood Dr & Pine Centre Frontage	0	0	205	0	0	0	0	670	123	443	612	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	410	443
10	Rec Place Dr & Ferry Ave	178	216	254	337	13	140	159	409	264	724	556	192
11	Wiebe Rd & Range Rd	143	67	13	72	27	104	29	113	95	55	170	23
12	Westwood Dr & Athlone Ave	0	813	28	221	719	0	0	0	0	38	40	76
13	Anthem Access & Ferry Ave	0	0	0	0	0	65	0	1397	0	0	802	87
14	Westwood Dr & Fairview Cres	0	832	13	13	745	0	0	0	0	4	0	8
15	Westwood Dr & Laurel Cres	0	832	16	12	738	0	0	0	0	8	0	13
16	Ryan Rd & Ferry Ave	45	0	73	68	0	74	61	692	48	63	732	80
SATURDAY PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO II TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	668	884	34	91	1430	58	89	484	1445	140	500	131
2	Hwy 16 & Playhouse Access	65	1755	0	0	2184	844	0	0	260	0	0	0
3	Hwy 16 & Ferry Ave	578	1021	266	81	1280	830	619	335	366	329	484	43
4	Hwy 16 & Range Rd	83	1590	0	0	1545	304	0	0	192	0	0	0
5	Westwood Dr & Massey Dr	490	272	273	208	493	71	70	384	344	109	225	29
6	Westwood Dr & Ferry Ave	20	447	160	331	343	62	77	436	11	74	435	490
7	Westwood Dr & Range Rd	95	227	3	174	190	9	31	178	79	3	248	424
8	Westwood Dr & Pine Centre Frontage	0	0	308	0	0	0	0	709	183	575	434	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	515	496
10	Rec Place Dr & Ferry Ave	219	286	320	451	21	263	238	435	355	984	641	289
11	Wiebe Rd & Range Rd	311	96	31	91	35	133	42	140	192	28	259	34
12	Westwood Dr & Athlone Ave	0	987	36	299	692	0	0	0	0	46	49	95
13	Anthem Access & Ferry Ave	0	0	0	0	0	93	0	1320	0	0	798	135
14	Westwood Dr & Fairview Cres	0	1010	12	11	726	0	0	0	0	6	0	13
15	Westwood Dr & Laurel Cres	0	1001	13	10	723	0	0	0	0	12	0	21
16	Ryan Rd & Ferry Ave	58	0	95	88	0	97	75	845	62	82	942	99

Table 4.5: 2023 Peak Hour Background + Site Development Scenario III Traffic Volumes

AM PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO III TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	590	646	88	115	392	23	20	688	513	79	578	106
2	Hwy 16 & Playhouse Access	17	1657	0	0	748	254	0	0	40	0	0	0
3	Hwy 16 & Ferry Ave	221	1556	690	67	455	166	193	276	128	396	276	79
4	Hwy 16 & Range Rd	90	2203	0	0	873	49	0	0	73	0	0	0
5	Westwood Dr & Massey Dr	224	159	297	123	171	63	34	464	109	90	268	11
6	Westwood Dr & Ferry Ave	55	304	90	113	192	23	44	250	81	66	185	220
7	Westwood Dr & Range Rd	40	144	1	43	94	16	73	58	41	1	59	89
8	Westwood Dr & Pine Centre Frontage	0	0	34	0	0	0	0	715	79	110	325	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	94	275
10	Rec Place Dr & Ferry Ave	29	65	64	128	1	50	84	381	91	211	359	65
11	Wiebe Rd & Range Rd	21	20	6	19	7	28	9	66	31	26	113	7
12	Westwood Dr & Athlone Ave	0	600	25	43	323	0	0	0	0	30	9	79
13	Anthem Access & Ferry Ave	0	0	0	0	0	32	0	597	0	0	382	53
14	Westwood Dr & Fairview Cres	0	604	3	3	350	0	0	0	0	10	0	21
15	Westwood Dr & Laurel Cres	0	577	4	3	357	0	0	0	0	18	0	31
16	Ryan Rd & Ferry Ave	18	0	30	33	0	36	17	494	14	18	417	22
PM PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO III TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	517	701	60	146	1491	41	71	634	1262	183	841	156
2	Hwy 16 & Playhouse Access	49	1317	0	0	2442	626	0	0	156	0	0	0
3	Hwy 16 & Ferry Ave	360	867	219	91	1618	691	545	397	453	780	606	64
4	Hwy 16 & Range Rd	68	1439	0	0	2492	216	0	0	182	0	0	0
5	Westwood Dr & Massey Dr	416	263	252	125	318	85	56	330	203	321	519	60
6	Westwood Dr & Ferry Ave	114	368	113	243	370	93	86	390	96	86	409	378
7	Westwood Dr & Range Rd	60	158	6	129	283	38	21	117	109	3	228	184
8	Westwood Dr & Pine Centre Frontage	0	0	205	0	0	0	0	690	127	443	668	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	390	471
10	Rec Place Dr & Ferry Ave	178	216	254	334	13	172	172	409	264	724	575	202
11	Wiebe Rd & Range Rd	143	67	13	72	27	104	29	114	96	55	170	23
12	Westwood Dr & Athlone Ave	0	823	61	107	725	0	0	0	0	37	11	96
13	Anthem Access & Ferry Ave	0	0	0	0	0	65	0	1394	0	0	802	87
14	Westwood Dr & Fairview Cres	0	875	13	13	749	0	0	0	0	4	0	8
15	Westwood Dr & Laurel Cres	0	875	16	12	742	0	0	0	0	8	0	13
16	Ryan Rd & Ferry Ave	45	0	73	68	0	74	61	705	48	63	782	80
SATURDAY PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO III TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	668	884	34	91	1366	58	89	484	1610	140	500	121
2	Hwy 16 & Playhouse Access	70	1755	0	0	2184	935	0	0	222	0	0	0
3	Hwy 16 & Ferry Ave	610	1026	266	79	1246	830	619	333	365	329	494	43
4	Hwy 16 & Range Rd	83	1626	0	0	1509	304	0	0	193	0	0	0
5	Westwood Dr & Massey Dr	485	284	303	208	410	71	70	384	195	173	225	29
6	Westwood Dr & Ferry Ave	20	456	160	335	352	54	81	451	11	74	462	523
7	Westwood Dr & Range Rd	95	236	3	177	197	9	31	178	79	3	248	424
8	Westwood Dr & Pine Centre Frontage	0	0	308	0	0	0	0	734	189	575	498	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	491	530
10	Rec Place Dr & Ferry Ave	219	286	320	447	21	302	258	435	355	984	662	310
11	Wiebe Rd & Range Rd	311	96	31	91	35	133	42	141	193	28	259	34
12	Westwood Dr & Athlone Ave	0	999	70	122	698	0	0	0	0	45	13	118
13	Anthem Access & Ferry Ave	0	0	0	0	0	93	0	1316	0	0	798	135
14	Westwood Dr & Fairview Cres	0	1056	12	11	732	0	0	0	0	6	0	13
15	Westwood Dr & Laurel Cres	0	1047	13	10	729	0	0	0	0	12	0	21
16	Ryan Rd & Ferry Ave	58	0	95	88	0	97	75	865	62	82	1002	99

Table 4.6: 2023 Peak Hour Background + Site Development Scenario IV Traffic Volumes

AM PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO IV TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	613	649	88	115	414	23	20	688	474	79	578	109
2	Hwy 16 & Playhouse Access	16	1683	0	0	748	240	0	0	59	0	0	0
3	Hwy 16 & Ferry Ave	216	1555	690	69	472	166	219	277	129	396	272	79
4	Hwy 16 & Range Rd	90	2198	0	0	891	49	0	0	72	0	0	0
5	Westwood Dr & Massey Dr	256	187	332	123	190	63	34	464	144	68	268	11
6	Westwood Dr & Ferry Ave	55	300	90	112	179	21	42	247	81	66	197	226
7	Westwood Dr & Range Rd	40	140	1	40	84	16	73	58	41	1	59	89
8	Westwood Dr & Pine Centre Frontage	0	0	34	0	0	0	0	754	76	110	303	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	0	224
10	Rec Place Dr & Ferry Ave	51	22	86	134	1	45	72	381	91	211	351	64
11	Wiebe Rd & Range Rd	21	20	6	19	7	28	9	64	29	26	113	7
12	Westwood Dr & Athlone Ave	0	613	10	78	322	0	0	0	0	16	15	161
13	Anthem Access & Ferry Ave	0	0	0	0	0	32	0	625	0	0	382	53
14	Westwood Dr & Fairview Cres	0	603	3	3	335	0	0	0	0	10	0	21
15	Westwood Dr & Laurel Cres	0	576	4	3	342	0	0	0	0	18	0	31
16	Ryan Rd & Ferry Ave	22	0	26	28	0	40	17	491	14	18	427	22
PM PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO IV TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	605	718	60	146	1547	41	71	634	1147	183	841	165
2	Hwy 16 & Playhouse Access	47	1423	0	0	2442	577	0	0	186	0	0	0
3	Hwy 16 & Ferry Ave	341	865	219	93	1646	691	651	399	454	780	596	64
4	Hwy 16 & Range Rd	68	1417	0	0	2521	216	0	0	181	0	0	0
5	Westwood Dr & Massey Dr	555	388	430	125	375	85	56	330	308	265	519	60
6	Westwood Dr & Ferry Ave	114	358	113	241	363	99	80	380	96	86	437	400
7	Westwood Dr & Range Rd	60	148	6	127	277	38	21	117	109	3	228	184
8	Westwood Dr & Pine Centre Frontage	0	0	205	0	0	0	0	872	123	443	612	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	0	224
10	Rec Place Dr & Ferry Ave	260	52	336	360	13	140	141	409	264	724	556	192
11	Wiebe Rd & Range Rd	143	67	13	72	27	104	29	113	95	55	170	23
12	Westwood Dr & Athlone Ave	0	863	28	221	719	0	0	0	0	38	40	500
13	Anthem Access & Ferry Ave	0	0	0	0	0	65	0	1503	0	0	802	87
14	Westwood Dr & Fairview Cres	0	882	13	13	745	0	0	0	0	4	0	8
15	Westwood Dr & Laurel Cres	0	882	16	12	738	0	0	0	0	8	0	13
16	Ryan Rd & Ferry Ave	53	0	65	58	0	84	61	692	48	63	814	80
SATURDAY PEAK HOUR BACKGROUND + SITE DEVELOPMENT SCENARIO IV TRAFFIC (veh/h)													
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Hwy 16 & Hwy 97	781	906	34	91	1430	58	89	484	1445	140	500	131
2	Hwy 16 & Playhouse Access	65	1889	0	0	2184	844	0	0	260	0	0	0
3	Hwy 16 & Ferry Ave	578	1021	266	81	1280	830	753	335	366	329	484	43
4	Hwy 16 & Range Rd	83	1590	0	0	1545	304	0	0	192	0	0	0
5	Westwood Dr & Massey Dr	659	442	523	208	493	71	70	384	344	109	225	29
6	Westwood Dr & Ferry Ave	20	447	160	331	343	62	77	436	11	74	499	554
7	Westwood Dr & Range Rd	95	227	3	174	190	9	31	178	79	3	248	424
8	Westwood Dr & Pine Centre Frontage	0	0	308	0	0	0	0	960	183	575	434	0
9	Hwy 97 Ramp & Hwy 97 On-ramp	0	0	0	0	0	101	0	0	0	0	0	224
10	Rec Place Dr & Ferry Ave	323	77	425	481	21	263	215	435	355	984	641	289
11	Wiebe Rd & Range Rd	311	96	31	91	35	133	42	140	192	28	259	34
12	Westwood Dr & Athlone Ave	0	1051	36	299	692	0	0	0	0	46	49	620
13	Anthem Access & Ferry Ave	0	0	0	0	0	93	0	1454	0	0	798	135
14	Westwood Dr & Fairview Cres	0	1074	12	11	726	0	0	0	0	6	0	13
15	Westwood Dr & Laurel Cres	0	1065	13	10	723	0	0	0	0	12	0	21
16	Ryan Rd & Ferry Ave	69	0	84	75	0	109	75	845	62	82	1046	99

5. Traffic Analysis

The intersection capacity for the PGGCC site accesses and adjacent study intersections was assessed in a single future horizon year 2023, which represents 15 years in the future when the site is expected to be fully built out.

5.1 Level of Service (LOS)

The Highway Capacity Manual (HCM 2000) defines Level of Service (LOS) as the average vehicular delay at an intersection. Table 5.1 presents the LOS and corresponding average total delays for signalized and unsignalized intersections. LOS "C" is assumed to be an acceptable design LOS in urban areas of BC.

Table 5.1: LOS and Corresponding Average Delay for Signalized and Unsignalized Intersections

LOS	DELAY (SECONDS)	
	Signalized Intersections	Unsignalized Intersections
A	<10	<10
B	≥10 and < 20	≥10 and < 15
C	≥20 and < 35	≥15 and < 25
D	≥35 and < 55	≥25 and < 35
E	≥55 and < 80	≥35 and < 50
F	≥80	≥50

Source: 2000 Highway Capacity Manual - Exhibits 16-2 (Signalized Intersections) and 17-2 (Unsignalized Intersections).

5.2 Analyzed Scenarios

The operations of intersections found in the project study area were evaluated during the weekday morning and afternoon peak hours, as well as the Saturday midday peak hour, for each of the following scenarios noted below, in the future horizon year:

- **Scenario I:** Reflects conditions without the re-developed PGGCC lands; and is reflective of the background scenario.
- **Scenario II:** Full development of PGGCC lands with network connection as proposed in the plan with both internal connections to Westwood and Athlone, and Highway 97 northbound via an underpass.
- **Scenario III:** Full development of PGGCC lands with network connection limited to the connection to Highway 97.
- **Scenarios IV:** Full development of PGGCC lands with network connection limited to the connection to Westwood and Athlone.

These scenarios were selected as they could provide the ability to answer the question of site viability with or without either connection, or in combination. Analysis Reports of the Synchro results providing details by movement are included in Appendix II.

5.2.1 Scenario I – 2023 No Re-Development of PGGCC Lands

Network Description

This scenario represents intersection geometric conditions and traffic volumes without the re-development of the PGGCC lands, but includes growth in background conditions. The intersection control for all study intersections reflects current existing conditions, with signal timing modifications where required to improve operations, as well as limited geometric improvements.

Geometric changes required include:

- Free-flow eastbound right turn lane from Highway 97 to Highway 16 with long downstream merge
- Three southbound through lanes at Highway 16 and Ferry Avenue with long downstream merge

Signal timing modifications (optimization) are required at the following intersections:

- Highway 16 and Highway 97
- Highway 16 and Ferry Avenue
- Rec Place Drive and Ferry Avenue

With these network improvements, the combined network travel times for the three peak hours (AM, PM and Saturday midday) decreases from 1,300 vehicle hours to 1,100 vehicle hours.

Traffic Operation Conditions

The analysis of the morning peak hour is summarized in Table 5.2 and indicates that all intersection and approaches within the study area operate at a LOS of “C” or better, except for the following:

- At the intersection of Highway 16 and Highway 97, the northbound and southbound approaches are at LOS “F” and “D” respectively, and the intersection as a whole is at LOS “D”. The northbound left turn movement has a volume to capacity ratio (v/c ratio) of 1.1; meaning that this movement is over capacity and it also operates with a LOS of “F”.
- At the intersection of Highway 16 and Ferry Avenue, the eastbound and westbound approaches are at LOS “D” and “E” respectively, and the intersection as a whole is at LOS “D”. The northbound through has a v/c ratio of 1.0, which indicates that this movement is at capacity, and this movement is expected to operate at a LOS of “D”.

For the PM Peak hour that is summarized in Table 5.3, the results indicate that acceptable level of service of “C” or better for all approaches and intersections with the exception of the following:

- At the intersection of Highway 16 and Highway 97, except for the eastbound approach, all other approaches are at LOS “E”, and the intersection as a whole is at LOS “D”. In addition, some individual movements are at a LOS of “F”, including the westbound left, the northbound left and the southbound left. Each of these movements has a v/c ratio of at least 1.0 and therefore these movements are over capacity.
- The intersection of Highway 16 and Ferry Avenue operates at LOS “D”, as does the southbound approach; however, the eastbound and westbound approaches experience longer delays and have an associated approach LOS of “E”. More specifically, the eastbound right and westbound left have v/c ratios of 1.0 and therefore these movements are at capacity.
- At the unsignalized intersection of Westwood Drive and Range Road, the southbound approach indicates a deterioration of service to LOS “F”.
- At the unsignalized intersection of Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movement at LOS “F”.

During the Saturday midday hour, which is summarized in Table 5.4, all approaches and intersections are expected to operate at LOS “C” or better, with the exception of the following:

- At the intersection of Highway 97 and Highway 16, except for the eastbound approach, all other approaches are at LOS “E”, and the intersection as a whole is at LOS “E”. The westbound left, the westbound through, the northbound left and the southbound through movements all have v/c ratios of 1.0, indicating that these movements are at capacity.
- At the intersection of Highway 16 and Ferry Avenue the eastbound and westbound approaches are at LOS “F” and “E” respectively, the northbound and southbound approaches are at LOS “D” and the intersection as a whole operates at a LOS “E”. The eastbound right, the westbound left and the southbound through movements have v/c ratios of 1.0 indicating that these movements are at capacity.
- At the intersection of Westwood Drive and Massey Drive, the northbound and southbound approaches as well as the intersection operate with a LOS of “D”. The northbound left turn movement has a v/c ratio of 1.1 indicating that this movement is over capacity.
- At the intersection of Westwood Drive and Range Road all of the southbound movements operate with LOS of “D”.
- At the unsignalized intersection of Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movement at LOS “F”.

Table 5.2: 2023 AM Peak Hour Background - Scenario I

2008+15 AM Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		20	688	410	79	578	95	590	574	88	115	245	23		
	V/C Ratio		0.1	0.7	0.3	0.4	0.5	0.1	1.1	0.8	0.1	0.6	0.4	0.0		
	Q-length (m) (95%)		7.9	110.5	0	22.2	85.8	5.9	#139.0	92.3	6	48.1	39.6	5.6		
	Delay (s)		23.3	35.4	0.4	20.6	27.8	14.2	126.2	43.6	25.6	45.9	38.7	32.4		
	LOS		C	D	A	C	C	B	F	D	C	D	D	C		
	Approach Delay (s)			22.3			25.3			81.3			40.5			
	Approach LOS			C			C			F			D		46.0	D
2	Hwy 16 & Playhouse Access	Unsig														
	Volume (vph)		0		11				5	1585			628	114		
	V/C Ratio				0.0				0.0	0.6			0.2	0.2		
	Q-length (m) (95%)				0.4				0.2	0.0			0.0	0.0		
	Delay (s)				10.4				9.7	0.0			0.0	0.0		
	LOS				B				A	A			A	A		
	Approach Delay (s)			10.4					0.0				0.0			
	Approach LOS			B					A				A		0.1	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		121	250	93	396	225	79	164	1544	690	63	430	46		
	V/C Ratio		0.5	0.6	0.2	0.9	0.4	0.2	0.3	1.0	0.6	0.5	0.2	0.0		
	Q-length (m) (95%)		25.5	45	14.2	#81.4	38.2	22.8	30.9	#258.0	62.1	15.2	32.3	5.3		
	Delay (s)		52.9	51.1	38.6	68.7	41.8	35.4	13.0	44.1	13.7	27.7	19.5	13.1		
	LOS		D	D	D	E	D	D	B	D	B	C	B	B		
	Approach Delay (s)			49.1			56.3			33.2			19.9			
	Approach LOS			D			E			C			B		37.2	D
4	Hwy 16 & Range	Unsig														
	Volume (vph)		0		49				83	2134			814	49		
	V/C Ratio				0.1				0.1	0.7			0.3	0.0		
	Q-length (m) (95%)				2.3				2.9	0.0			0.0	0.0		
	Delay (s)				11.9				10.3	0.0			0.0	0.0		
	LOS				B				B	A			A	A		
	Approach Delay (s)			11.9					0.4				0.0			
	Approach LOS			B					A				A		0.5	A
5	Westwood & Massey	Sig														
	Volume (vph)		34	464	76	65	268	11	166	125	221	123	155	63		
	V/C Ratio		0.1	0.5	0.1	0.2	0.3	0.3	0.5	0.2	0.2	0.4	0.3	0.3		
	Q-length (m) (95%)		6.8	40.9	6.1	11	24.7	24.7	30.3	15	17	23.2	19.3	19.3		
	Delay (s)		15.8	20.1	13.1	11.6	15.7	15.7	20.7	23.0	18.2	21.5	24.7	24.7		
	LOS		B	C	B	B	B	B	C	C	B	C	C	C		
	Approach Delay (s)			18.9			14.9			20.2			23.6			

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2008+15 AM Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
	Approach LOS			B			B			C			C		19.4	B
6	Westwood & Ferry	Sig														
	Volume (vph)		35	200	81	66	145	174	55	291	90	90	151	8		
	V/C Ratio		0.2	0.4	0.4	0.4	0.2	0.1	0.2	0.7	0.7	0.2	0.2	0.2		
	Q-length (m) (95%)		10	20.2	20.2	16.9	14.3	8.5	11.1	60.2	60.2	9.9	16.3	16.3		
	Delay (s)		17.3	18.1	18.1	19.1	17.3	12.4	11.9	17.5	17.5	6.7	5.5	5.5		
	LOS		B	B	B	B	B	B	B	B	B	A	A	A		
	Approach Delay (s)			18.0			15.4			16.8			5.9			
	Approach LOS			B			B			B			A		14.7	B
7	Westwood & Range	Unsig														
	Volume (vph)		73	49	41	1	31	89	40	131	1	33	63	16		
	V/C Ratio		0.3	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.2		
	Q-length (m) (95%)															
	Delay (s)		9.5	9.5	9.5	8.6	8.6	8.6	9.8	9.8	9.8	9.0	9.0	9.0		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			9.5			8.6			9.8			9.0			
	Approach LOS			A			A			A			A		9.3	A
8	Massey & Pine Centre Frontage	Unsig														
	Volume (vph)			648	71	110	300		0		34					
	V/C Ratio			0.2	0.1	0.2	0.1				0.1					
	Q-length (m) (95%)			0.0	0.0	4.2	0.0				1.4					
	Delay (s)			0.0	0.0	9.9	0.0				10.2					
	LOS			A	A	A	A				B					
	Approach Delay (s)			0.0			2.6			10.2						
	Approach LOS			A			A			B					1.2	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		59	323	70	96	306	4	29	22	3	115	1	30		
	V/C Ratio		0.1	0.4	0.4	0.2	0.3	0.3	0.1	0.1	0.1	0.5	0.0	0.0		
	Q-length (m) (95%)		7.2	25.7	25.7	10.5	21.7	21.7	7.2	6.2	6.2	21.2	4.5	4.5		
	Delay (s)		8.1	11.1	11.1	7.0	9.8	9.8	16.9	16.6	16.6	20.7	16.3	16.3		
	LOS		A	B	B	A	A	A	B	B	B	C	B	B		
	Approach Delay (s)			10.7			9.2			16.8			19.7			
	Approach LOS			B			A			B			B		11.7	B
11	Wiebe & Range	Unsig														
	Volume (vph)			61	26	26	113		21		6					
	V/C Ratio			0.1	0.1	0.0	0.0		0.1		0.1					
	Q-length (m) (95%)			0.0	0.0	0.5	0.5		1.1		1.1					
	Delay (s)			0.0	0.0	1.5	1.5		10.2		10.2					
	LOS			A	A	A	A		B		B					
	Approach Delay (s)			0.0			1.5			10.2						

2008+15 AM Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
	Approach LOS			A			A			B					1.9	A
13	Anthem & Ferry	Unsig														
	Volume (vph)		0	465			382	53				0		32		
	V/C Ratio			0.2			0.1	0.1						0.0		
	Q-length (m) (95%)			0.0			0.0	0.0						1.0		
	Delay (s)			0.0			0.0	0.0						9.4		
	LOS			A			A	A						A		
	Approach Delay (s)			0.0			0.0						9.4			
	Approach LOS			A			A						A		0.3	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Table 5.3: 2023 PM Peak Hour Background Scenario I

2008+15 PM Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		71	634	925	183	841	123	517	461	60	146	1005	41		
	V/C Ratio		0.6	0.8	0.6	1.0	0.9	0.1	1.0	0.8	0.0	0.3	1.0	0.1		
	Q-length (m) (95%)		24.7	113.1	0	#75.5	#163.2	0	#115.5	82.7	5.1	54.4	#192.9	13.2		
	Delay (s)		42.5	52.1	1.3	89.3	62.0	0.1	90.4	57.9	38.4	35.8	62.8	28.3		
	LOS		D	D	A	F	E	A	F	E	D	D	E	C		
	Approach Delay (s)			22.8			59.7			73.0			58.3			
	Approach LOS			C			E			E			E		50.1	D
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		21				13	1076			2027	187		
	V/C Ratio				0.1				0.1	0.3			0.5	0.4		
	Q-length (m) (95%)				1.8				1.7	0.0			0.0	0.0		
	Delay (s)				17.3				24.2	0.0			0.0	0.0		
	LOS				C				C	A			A	A		
	Approach Delay (s)				17.3					0.3			0.0			
	Approach LOS				C					A			A		0.2	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		304	317	350	780	439	64	174	831	219	72	1502	276		
	V/C Ratio		0.7	0.7	1.0	1.0	0.6	0.1	0.8	0.7	0.2	0.4	0.9	0.3		
	Q-length (m) (95%)		58.6	60.7	#114.7	#160.5	75.4	18.6	#75.5	130.1	10.6	21.1	#189.3	45.7		
	Delay (s)		59.0	57.8	107.4	72.4	43.1	32.5	56.0	35.5	9.9	28.1	53.1	21.1		
	LOS		E	E	F	E	D	C	E	D	A	C	D	C		
	Approach Delay (s)			76.1			60.4			33.8			47.3			

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2008+15 PM Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
	Approach LOS			E			E			C			D		52.6	D
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		105				45	1216			2273	216		
	V/C Ratio				0.7				0.3	0.4			0.7	0.1		
	Q-length (m) (95%)				28.7				7.2	0.0			0.0	0.0		
	Delay (s)				58.7				29.5	0.0			0.0	0.0		
	LOS				F				D	A			A	A		
	Approach Delay (s)			58.7						1.1			0.0			
	Approach LOS			F						A			A		1.9	A
5	Westwood & Massey	Sig														
	Volume (vph)		56	330	101	254	519	60	318	220	161	125	269	85		
	V/C Ratio		0.2	0.4	0.1	0.6	0.5	0.5	0.9	0.3	0.1	0.4	0.5	0.5		
	Q-length (m) (95%)		10.9	31.2	7.4	40.8	54.4	54.4	#86.7	24.2	10.8	24.2	34.6	34.6		
	Delay (s)		17.5	21.2	14.4	18.8	21.1	21.1	45.4	22.3	16.8	21.1	25.6	25.6		
	LOS		B	C	B	B	C	C	D	C	B	C	C	C		
	Approach Delay (s)			19.4			20.4			31.6			24.5			
	Approach LOS			B			C			C			C		24.1	C
6	Westwood & Ferry	Sig														
	Volume (vph)		59	220	96	86	282	250	114	330	113	175	328	78		
	V/C Ratio		0.3	0.4	0.4	0.5	0.4	0.3	0.4	0.8	0.8	0.5	0.4	0.4		
	Q-length (m) (95%)		15	22.1	22.1	21.1	25.1	15.5	22.8	74.1	74.1	18.3	42.1	42.1		
	Delay (s)		19.8	19.4	19.4	21.7	19.3	14.3	14.4	21.0	21.0	10.1	7.3	7.3		
	LOS		B	B	B	C	B	B	B	C	C	B	A	A		
	Approach Delay (s)			19.4			17.6			19.7			8.1			
	Approach LOS			B			B			B			A		15.9	B
7	Westwood & Range	Unsig														
	Volume (vph)		21	88	109	3	124	184	60	120	6	118	251	38		
	V/C Ratio		0.6	0.6	0.6	0.8	0.8	0.8	0.6	0.6	0.6	1.1	1.1	1.1		
	Q-length (m) (95%)															
	Delay (s)		21.5	21.5	21.5	33.5	33.5	33.5	20.2	20.2	20.2	85.4	85.4	85.4		
	LOS		C	C	C	D	D	D	C	C	C	F	F	F		
	Approach Delay (s)			21.5			33.5			20.2			85.4			
	Approach LOS			C			D			C			F		47.8	E

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2008+15 PM Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			610	116	443	601		0		205					
	V/C Ratio			0.2	0.1	0.6	0.2				0.4					
	Q-length (m) (95%)			0.0	0.0	33.3	0.0				14.4					
	Delay (s)			0.0	0.0	15.6	0.0				14.5					
	LOS			A	A	C	A				B					
	Approach Delay (s)			0.0			6.6			14.5						
	Approach LOS			A			A			B					5.0	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		98	285	191	331	394	8	178	52	26	264	13	74		
	V/C Ratio		0.3	0.5	0.5	0.7	0.4	0.4	0.5	0.1	0.1	0.7	0.1	0.1		
	Q-length (m) (95%)		14.9	34.8	34.8	49.1	38.7	38.7	40.3	14.8	14.8	61.6	10.4	10.4		
	Delay (s)		15.7	22.2	22.2	14.9	17.1	17.1	19.7	16.4	16.4	25.8	16.2	16.2		
	LOS		B	C	C	B	B	B	B	B	B	C	B	B		
	Approach Delay (s)			21.1			16.1			18.7			23.4			
	Approach LOS			C			B			B			C		19.3	B
11	Wiebe & Range	Unsig		1	1	2	2		3		3					
	Volume (vph)			109	91	55	170		143		13					
	V/C Ratio			0.1	0.1	0.1	0.1		0.3		0.3					
	Q-length (m) (95%)			0.0	0.0	1.1	1.1		10.1		10.1					
	Delay (s)			0.0	0.0	2.2	2.2		14.6		14.6					
	LOS			A	A	A	A		B		B					
	Approach Delay (s)			0.0			2.2			14.6						
	Approach LOS			A			A			B					4.8	A
13	Anthem & Ferry	Unsig		1			3	5.0						6.0		
	Volume (vph)		0	972			802	87				0		65		
	V/C Ratio			0.3			0.2	0.2						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						1.9		
	Delay (s)			0.0			0.0	0.0						9.4		
	LOS			A			A	A						A		
	Approach Delay (s)			0.0			0.0						9.4			
	Approach LOS			A			A						A		0.3	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Table 5.4: 2023 Saturday MD Peak Hour Background Scenario I

2008+15 Saturday Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		71	634	925	183	841	123	517	461	60	146	1005	41		
	V/C Ratio		0.6	0.8	0.6	1.0	1.0	0.1	1.0	0.8	0.1	0.3	1.0	0.1		
	Q-length (m) (95%)		#26.1	114	0	#83.7	#165.0	5.9	#116.7	83.4	4.7	56.4	#203.5	13.5		
	Delay (s)		47.0	52.8	1.4	111.0	67.1	12.6	102.6	58.0	37.5	37.5	83.6	28.9		
	LOS		D	D	A	F	E	B	F	E	D	D	F	C		
	Approach Delay (s)			23.4			68.3			79.0			76.0			
	Approach LOS			C			E			E			E		57.7	E
2	Hwy 16 & Playhouse Access	Unsig														
	Volume (vph)		0		21				13	1076			2027	187		
	V/C Ratio				0.1				0.1	0.3			0.5	0.4		
	Q-length (m) (95%)				1.7				1.6	0.0			0.0	0.0		
	Delay (s)				17.2				23.7	0.0			0.0	0.0		
	LOS				C				C	A			A	A		
	Approach Delay (s)			17.2					0.3				0.0			
	Approach LOS			C					A				A		0.2	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		304	317	350	780	439	64	174	831	219	72	1502	276		
	V/C Ratio		0.8	0.7	1.0	1.0	0.6	0.1	0.8	0.7	0.2	0.4	1.0	0.3		
	Q-length (m) (95%)		64.3	66.7	#119.4	#174.0	82.6	19.8	#82.1	142.2	11	22.7	#209.0	51.2		
	Delay (s)		64.8	63.9	108.4	79.2	46.7	34.5	61.5	38.0	10.2	30.2	61.0	23.0		
	LOS		E	E	F	E	D	C	E	D	B	C	E	C		
	Approach Delay (s)			80.2			65.8			36.4			54.1			
	Approach LOS			F			E			D			D		57.6	E
4	Hwy 16 & Range	Unsig														
	Volume (vph)		0		105				45	1216			2273	216		
	V/C Ratio				0.7				0.3	0.4			0.7	0.1		
	Q-length (m) (95%)				33.1				8.7	0.0			0.0	0.0		
	Delay (s)				69.7				34.2	0.0			0.0	0.0		
	LOS				F				D	A			A	A		
	Approach Delay (s)			69.7					1.2				0.0			
	Approach LOS			F					A				A		2.3	A

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2008+15 Saturday Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		56	330	101	254	519	60	318	220	161	125	269	85		
	V/C Ratio		0.4	0.5	0.1	0.9	0.7	0.7	1.1	0.3	0.1	0.5	0.7	0.7		
	Q-length (m) (95%)		14.3	45	4.8	56.4	72.5	72.5	#92.5	29.6	9.7	29	47.4	47.4		
	Delay (s)		26.5	32.5	17.3	35.6	29.8	29.8	84.4	27.6	17.4	27.5	38.1	38.1		
	LOS		C	C	B	D	C	C	F	C	B	C	D	D		
	Approach Delay (s)			28.6			31.6			51.1			35.3			
	Approach LOS			C			C			D			D		37.2	D
6	Westwood & Ferry	Sig														
	Volume (vph)		59	220	96	86	282	250	114	330	113	175	328	78		
	V/C Ratio		0.3	0.4	0.4	0.4	0.4	0.1	0.4	0.7	0.7	0.4	0.4	0.4		
	Q-length (m) (95%)		14.4	20.6	20.6	19.8	23.6	10	21.5	69.2	69.2	17.3	38.6	38.6		
	Delay (s)		18.7	18.5	18.5	20.1	18.6	12.3	14.3	19.2	19.2	7.8	6.6	6.6		
	LOS		B	B	B	C	B	B	B	B	B	A	A	A		
	Approach Delay (s)			18.5			16.3			18.2			7.0			
	Approach LOS			B			B			B			A		14.6	B
7	Westwood & Range	Unsig														
	Volume (vph)		21	88	109	3	124	184	60	120	6	118	251	38		
	V/C Ratio		0.5	0.5	0.5	0.6	0.6	0.6	0.4	0.4	0.4	0.8	0.8	0.8		
	Q-length (m) (95%)															
	Delay (s)		14.2	14.2	14.2	17.3	17.3	17.3	14.0	14.0	14.0	26.0	26.0	26.0		
	LOS		B	B	B	C	C	C	B	B	B	D	D	D		
	Approach Delay (s)			14.2			17.3			14.0			26.0			
	Approach LOS			B			C			B			D		19.3	C
8	Massey & Pine Centre Frontage	Unsig														
	Volume (vph)			610	116	443	601		0		205					
	V/C Ratio			0.2	0.1	0.5	0.2				0.3					
	Q-length (m) (95%)			0.0	0.0	20.4	0.0				8.5					
	Delay (s)			0.0	0.0	11.9	0.0				11.1					
	LOS			A	A	B	A				B					
	Approach Delay (s)			0.0			5.1			11.1						
	Approach LOS			A			A			B					3.8	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		98	285	191	331	394	8	178	52	26	264	13	74		
	V/C Ratio		0.4	0.6	0.6	0.9	0.4	0.4	0.6	0.1	0.1	0.8	0.1	0.1		
	Q-length (m) (95%)		14.3	31.8	31.8	#62.3	34	34	36.5	12.8	12.8	56	7.8	7.8		
	Delay (s)		18.4	23.6	23.6	29.4	16.1	16.1	21.1	16.8	16.8	32.4	16.5	16.5		
	LOS		B	C	C	C	B	B	C	B	B	C	B	B		
	Approach Delay (s)			22.7			22.1			19.8			28.5			
	Approach LOS			C			C			B			C		23.1	C

Prince George Golf and Curling Club Land Traffic Study

2008+15 Saturday Peak Hour Background with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
11	Wiebe & Range	Unsig														
	Volume (vph)			109	91	55	170		143		13					
	V/C Ratio			0.1	0.1	0.1	0.1		0.4		0.4					
	Q-length (m) (95%)			0.0	0.0	1.2	1.2		12.8		12.8					
	Delay (s)			0.0	0.0	2.3	2.3		16.2		16.2					
	LOS			A	A	A	A		C		C					
	Approach Delay (s)			0.0			2.3			16.2						
	Approach LOS			A			A			C					5.2	A
13	Anthem & Ferry	Unsig														
	Volume (vph)		0	972			802	87				0		65		
	V/C Ratio			0.3			0.2	0.2						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						1.9		
	Delay (s)			0.0			0.0	0.0						9.3		
	LOS			A			A	A						A		
	Approach Delay (s)			0.0			0.0					9.3				
	Approach LOS			A			A					A			0.3	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

5.2.2 Scenario II – 2023 Full Development of PGGCC Lands- With: Both Athlone Avenue and Highway 97 Connections

Network Description

The addition of site generated traffic resulted in a deterioration of the level of service on the intersections in the study area. Poor operating conditions at the unsignalized intersections of Westwood Drive at Range Road and Wiebe Road at Range Road required signalization of these intersections. The following signal timing and geometric improvements were required to improve operations, and were assumed to be in place:

New signalized intersections:

- Westwood Drive and Range Road
- Wiebe Road and Range Road

Geometric changes required:

- Free-flow eastbound right turn lane from Highway 97 to Highway 16 with long downstream merge
- Three southbound through lanes at Highway 16 and Ferry Avenue with long downstream merge
- Free-flow southbound right turn lane from Highway 16 to Ferry Avenue with long downstream merge
- Dual northbound left turn lanes from Highway 16 to Ferry in protected phase with 100 m of storage
- Dual eastbound left turn lanes and westbound left turn lanes from Ferry Avenue to Rec Place Drive in protected phase with sufficient storage, 50 m EB and 120 m WB, and long downstream merge
- Dual southbound left turn lanes from Rec Place Drive to Ferry Avenue in protected phase with 100 m storage
- Exclusive northbound left turn lane from Rec Place Drive to Ferry Avenue in protected-permissive phase with 100 m storage
- Exclusive eastbound right turn lane from Ferry Avenue to Rec Place Drive with 50 m storage
- Exclusive northbound right turn lane and southbound right turn lane from Rec Place Drive to Ferry Avenue with 30 m NB and 30 m SB storage
- Two-way left turn lane on Westwood between Pine Centre Mall South Access and Ferry Avenue
- Increase northbound left turn lane storage to 150 m at Highway 16 and Highway 97
- Increase eastbound left turn lane storage to 80 m at Highway 16 and Ferry Avenue
- Increase eastbound right turn lane storage to 50 m at Highway 16 and Ferry Avenue
- Increase westbound right turn lane storage to 30 m at Westwood Drive and Athlone Avenue
- Increase northbound right turn lane and southbound right turn lane storage to 30 m at Ryan Road and Ferry Avenue
- Increase northbound left turn lane and southbound left turn lane storage to 30 m at Westwood Drive and Range Road
- Increase eastbound left turn lane and westbound left turn lane storage to 30 m at Range Road and Wiebe Road
- Increase northbound left turn lane storage to 40m at Range Road and Wiebe Road

Signal timing modifications (optimization) are required at the following intersections:

- Highway 16 and Highway 97
- Highway 16 and Ferry Avenue
- Rec Place Drive and Ferry Avenue
- Westwood Drive and Ferry Avenue
- Westwood Drive and Massey Drive
- New phasing with a permissive-overlay for eastbound right, northbound right, and southbound right at Rec Place Drive and Ferry Avenue

With these new network improvements, the combined network travel times for the three peak hours decreases from 4,600 vehicle hours to 1,600 vehicle hours.

Traffic Operation Conditions

The morning peak hour results of the analysis summarized in Table 5.5 indicate that all intersection and approaches within the study area operate at a LOS of “C” or better, except for the following.

- At the intersection of Highway 16 and Highway 97 the northbound and southbound approaches are at LOS “F” and “D” respectively, and the intersection as a whole is at LOS “D”. The northbound left turn movement has a v/c ratio of 1.2; meaning that this movement is over capacity and it also operates with a LOS of “F”.
- At the intersection of Highway 16 and Ferry Avenue the eastbound, westbound, and northbound approaches are at LOS “D”, “E”, and “D” respectively, and the intersection as a whole is at LOS “D”. The northbound through has a v/c ratio of 1.0, which indicates that this movement is at capacity, and this movement is expected to operate at a LOS of “D”.

For the PM Peak hour, summarized in Table 5.6, the results indicate that acceptable level of service of “C” or better for all approaches and intersections with the exception of the following:

- At the intersection of Highway 97 and Highway 16, except for the eastbound approach, all other approaches are at LOS “F”, and the intersection as a whole is at LOS “F”. The addition of site traffic exacerbates the poor existing conditions. The westbound left, westbound through, northbound left, and southbound through movements all have v/c ratios of 1.0 or greater which indicates that these movements are over capacity.
- At the intersection of Highway 16 and Ferry Avenue, the eastbound and westbound approaches have a LOS “F” and northbound and southbound approaches have a LOS “D” and “E” respectively. This intersection as a whole operates at LOS “E”. The eastbound left, eastbound right, westbound left, westbound through and the southbound through have v/c ratios of 1.0 or greater indicating that these movements are over capacity.
- At the intersection of Rec Place Drive and Ferry Avenue the westbound and southbound approaches have LOS “E” and “F” respectively, and the intersection as a whole operates at a LOS “D”. The westbound left and the southbound left have v/c ratios of 1.1 and 1.2 respectively, meaning that these movements are over capacity.
- At the unsignalized intersection of Highway 16 and Playhouse Access, and Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movements at LOS “F”.

Table 5.5: 2023 AM Peak Hour Background + Site Development Scenario II

2008+15 AM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		20	688	474	79	578	109	590	646	88	115	414	23		
	V/C Ratio		0.1	0.7	0.3	0.4	0.6	0.1	1.2	0.8	0.1	0.6	0.6	0.0		
	Q-length (m) (95%)		7.8	101	0	22.1	83	7.1	#133.1	92.5	7.3	#51.1	60.5	5.3		
	Delay (s)		22.9	34.0	0.5	22.6	28.6	15.5	161.6	40.7	24.8	48.4	38.8	29.7		
	LOS		C	C	A	C	C	B	F	D	C	D	D	C		
	Approach Delay (s)			20.4			26.1			93.5			40.5			
	Approach LOS			C			C			F			D		49.7	D
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		59				16	1657			748	240		
	V/C Ratio				0.1				0.0	0.6			0.2	0.3		
	Q-length (m) (95%)				3.2				0.6	0.0			0.0	0.0		
	Delay (s)				12.2				9.8	0.0			0.0	0.0		
	LOS				B				A	A			A	A		
	Approach Delay (s)			12.2						0.1			0.0			
	Approach LOS			B						A			A		0.3	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		193	277	129	396	272	79	216	1555	690	69	472	166		
	V/C Ratio		0.6	0.7	0.1	0.9	0.5	0.2	0.6	1.0	0.6	0.5	0.2	0.1		
	Q-length (m) (95%)		37.1	49.3	10	#82.6	47.4	24.1	40.7	#265.5	69.6	18.4	38.6	0		
	Delay (s)		53.7	51.6	35.2	70.0	45.1	37.5	53.4	48.0	14.4	29.2	22.2	0.1		
	LOS		D	D	D	E	D	D	D	D	B	C	C	A		
	Approach Delay (s)			48.7			57.5			39.1			17.7			
	Approach LOS			D			E			D			B		40.0	D
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		72				90	2198			891	49		
	V/C Ratio				0.1				0.1	0.7			0.3	0.0		
	Q-length (m) (95%)				3.7				3.5	0.0			0.0	0.0		
	Delay (s)				12.8				10.8	0.0			0.0	0.0		
	LOS				B				B	A			A	A		
	Approach Delay (s)			12.8						0.4			0.0			
	Approach LOS			B						A			A		0.6	A

2008+15 AM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		34	464	144	68	268	11	220	151	276	123	190	63		
	V/C Ratio		0.1	0.5	0.1	0.2	0.3	0.3	0.6	0.3	0.3	0.4	0.5	0.5		
	Q-length (m) (95%)		7.4	43.8	8.5	12.5	26.6	26.6	40	17.5	25.7	23.2	25	25		
	Delay (s)		16.5	20.9	12.7	12.3	16.4	16.4	23.0	24.0	19.6	21.9	27.0	27.0		
	LOS		B	C	B	B	B	B	C	C	B	C	C	C		
	Approach Delay (s)			18.8			15.6			21.8			25.3			
	Approach LOS			B			B			C			C		20.4	C
6	Westwood & Ferry	Sig														
	Volume (vph)		42	247	81	66	182	211	55	300	90	112	179	21		
	V/C Ratio		0.2	0.4	0.4	0.4	0.3	0.1	0.2	0.7	0.7	0.3	0.2	0.2		
	Q-length (m) (95%)		11.5	25.5	25.5	16.9	17.2	9.3	11.4	63.8	63.8	12.5	20.3	20.3		
	Delay (s)		17.5	18.6	18.6	19.1	17.5	12.6	12.3	18.5	18.5	7.5	6.1	6.1		
	LOS		B	B	B	B	B	B	B	B	B	A	A	A		
	Approach Delay (s)			18.5			15.4			17.8			6.6			
	Approach LOS			B			B			B			A		15.1	B
7	Westwood & Range	Sig														
	Volume (vph)		73	58	41	1	59	89	40	140	1	40	84	16		
	V/C Ratio		0.2	0.2	0.2	0.0	0.3	0.3	0.1	0.2	0.2	0.1	0.1	0.1		
	Q-length (m) (95%)		5.1	5.1	5.1	0.4	5.9	5.9	3.4	8.4	8.4	3.4	5.9	5.9		
	Delay (s)		8.8	8.7	8.7	8.1	8.9	8.9	3.3	3.5	3.5	3.4	3.4	3.4		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			8.7			8.9			3.5			3.4			
	Approach LOS			A			A			A			A		6.1	A
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			699	76	110	303		0		34					
	V/C Ratio			0.3	0.1	0.2	0.1				0.1					
	Q-length (m) (95%)			0.0	0.0	4.4	0.0				1.4					
	Delay (s)			0.0	0.0	10.2	0.0				10.4					
	LOS			A	A	B	A				B					
	Approach Delay (s)			0.0			2.7			10.4						
	Approach LOS			A			A			B					1.2	A
9	Hwy 97 Ramp & Hwy 97 On-ramp	Unsig					1	2	6	7	8	11	12	3		
	Volume (vph)		0	0			111	282				0		101		
	V/C Ratio						0.1	0.2						0.1		
	Q-length (m) (95%)						0.0	0.0						3.0		
	Delay (s)						0.0	0.0						9.4		
	LOS						A	A						A		
	Approach Delay (s)						0.0						9.4			
	Approach LOS						A						A		1.9	A

2008+15 AM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
10	Rec Place & Ferry	Sig														
	Volume (vph)		80	381	91	211	351	64	29	65	64	130	1	45		
	V/C Ratio		0.3	0.5	0.1	0.5	0.4	0.4	0.1	0.3	0.1	0.4	0.0	0.0		
	Q-length (m) (95%)		10.6	31	5.4	22.5	30.6	30.6	7	16.5	6.5	15.8	1	4.6		
	Delay (s)		25.8	18.6	10.0	23.8	15.7	15.7	15.3	24.4	16.2	24.4	24.9	20.9		
	LOS		C	B	B	C	B	B	B	C	B	C	C	C		
	Approach Delay (s)			18.2			18.4			19.4			23.5			
	Approach LOS			B			B			B			C		19.0	B
11	Wiebe & Range	Sig														
	Volume (vph)		9	64	29	26	113	7	21	20	6	19	7	28		
	V/C Ratio		0.0	0.2	0.2	0.1	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0		
	Q-length (m) (95%)		1	4	4	1.9	5.7	5.7	2	2.2	2.2	1.9	2.1	2.1		
	Delay (s)		7.8	8.3	8.3	7.9	8.7	8.7	3.4	3.4	3.4	3.4	3.4	3.4		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			8.3			8.6			3.4			3.4			
	Approach LOS			A			A			A			A		7.0	A
12	Westwood & Athlone	Unsig				1		1		2	2	3	4			
	Volume (vph)					16		48		598	10	78	322			
	V/C Ratio					0.1		0.1		0.4	0.4	0.1	0.2			
	Q-length (m) (95%)					2.9		2.9		0.0	0.0	2.3	0.0			
	Delay (s)					13.8		13.8		0.0	0.0	9.3	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						13.8			0.0			1.8			
	Approach LOS						B			A			A		1.5	A
13	Anthem & Ferry	Unsig		1			3	6.0						7.0		
	Volume (vph)		0	599			382	53				0		32		
	V/C Ratio			0.2			0.1	0.1						0.0		
	Q-length (m) (95%)			0.0			0.0	0.0						0.9		
	Delay (s)			0.0			0.0	0.0						9.2		
	LOS			A			A	A						A		
	Approach Delay (s)			0.0			0.0						9.2			
	Approach LOS			A			A						A		0.3	A
14	Westwood & Fairview	Unsig				1		1		2	2	3	4			
	Volume (vph)					10		21		588	3	3	335			
	V/C Ratio					0.1		0.1		0.4	0.4	0.0	0.2			
	Q-length (m) (95%)					1.1		1.1		0.0	0.0	0.1	0.0			
	Delay (s)					13.0		13.0		0.0	0.0	8.8	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						13.0			0.0			0.1			
	Approach LOS						B			A			A		0.4	A

2008+15 AM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
15	Westwood & Laurel	Unsig				1		1		2	2	3	4			
	Volume (vph)					18		31		561	4	3	342			
	V/C Ratio					0.1		0.1		0.4	0.4	0.0	0.2			
	Q-length (m) (95%)					1.6		1.6		0.0	0.0	0.1	0.0			
	Delay (s)					12.8		12.8		0.0	0.0	8.8	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)							12.8		0.0			0.1			
	Approach LOS							B		A			A		0.7	A
16	Ryan & Ferry	Unsig														
	Volume (vph)		17	491	14	18	405	22	18	0	30	33	0	36		
	V/C Ratio		0.0	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
	Q-length (m) (95%)		0.4	0.0	0.0	0.4	0.0	0.0	1.3	1.3	1.3	2.4	2.4	2.4		
	Delay (s)		0.7	0.0	0.0	0.9	0.0	0.0	12.3	12.3	12.3	12.7	12.7	12.7		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			0.4			0.4			12.3			12.7			
	Approach LOS			A			A			B			B		1.4	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Table 5.6: 2023 PM Peak Hour Background + Site Development Scenario II

2008+15 PM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		71	634	1147	183	841	165	517	701	60	146	1547	41		
	V/C Ratio		0.6	0.8	0.7	1.3	1.0	0.1	1.2	0.8	0.0	0.3	1.2	0.1		
	Q-length (m) (95%)		#29.3	123.6	0	#101.5	#190.7	19.5	#138.9	123.8	4.7	61	#343.6	13		
	Delay (s)		51.4	61.2	2.3	207.8	97.5	17.8	186.4	56.4	35.3	41.9	127.6	23.6		
	LOS		D	E	A	F	F	B	F	E	D	D	F	C		
	Approach Delay (s)			24.3			103.4			108.0			117.9			
	Approach LOS			C			F			F			F		84.3	F
2	Hwy 16 & Playhouse Access	Unsig														
	Volume (vph)		0		186				47	1317			2442	577		
	V/C Ratio				1.1				0.3	0.4			0.6	0.7		
	Q-length (m) (95%)				76.9				9.7	0.0			0.0	0.0		
	Delay (s)				154.4				37.4	0.0			0.0	0.0		
	LOS				F				E	A			A	A		
	Approach Delay (s)			154.4					1.3				0.0			
	Approach LOS			F					A				A		6.7	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		545	399	454	780	596	64	341	865	219	93	1646	691		
	V/C Ratio		1.0	0.8	1.1	1.0	1.0	0.1	0.8	0.7	0.2	0.5	1.1	0.4		
	Q-length (m) (95%)		#125.4	82.1	#159.2	#181.4	#133.5	23.3	#76.9	142.1	12.7	26.2	#238.4	0		
	Delay (s)		88.1	67.8	129.6	96.2	79.4	41.1	72.5	38.5	11.2	32.4	95.3	0.7		
	LOS		F	E	F	F	E	D	E	D	B	C	F	A		
	Approach Delay (s)			95.8			86.8			42.4			66.0			
	Approach LOS			F			F			D			E		71.7	E
4	Hwy 16 & Range	Unsig														
	Volume (vph)		0		181				68	1417			2521	216		
	V/C Ratio				1.4				0.5	0.5			0.8	0.1		
	Q-length (m) (95%)				95.8				17.1	0.0			0.0	0.0		
	Delay (s)				272.2				48.6	0.0			0.0	0.0		
	LOS				F				E	A			A	A		
	Approach Delay (s)			272.2					2.2				0.0			
	Approach LOS			F					A				A		11.9	B

2008+15 PM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		56	330	308	265	519	60	419	253	228	125	375	85		
	V/C Ratio		0.3	0.5	0.3	0.7	0.6	0.6	0.8	0.2	0.1	0.4	0.7	0.7		
	Q-length (m) (95%)		17.5	51.1	44.8	#73.5	81.8	81.8	#111.8	28.8	13.5	25.8	67.3	67.3		
	Delay (s)		32.2	38.8	19.1	31.2	34.6	34.6	24.8	20.6	12.7	31.5	41.4	41.4		
	LOS		C	D	B	C	C	C	C	C	B	C	D	D		
	Approach Delay (s)			29.5			33.5			20.5			39.3			
	Approach LOS			C			C			C			D		29.9	C
6	Westwood & Ferry	Sig														
	Volume (vph)		80	380	96	86	387	350	114	358	113	241	363	99		
	V/C Ratio		0.5	0.6	0.6	0.7	0.5	0.5	0.5	0.8	0.8	0.8	0.5	0.5		
	Q-length (m) (95%)		20.7	39.8	39.8	#27.8	33.9	30.9	24	#93.7	#93.7	#43.2	49.3	49.3		
	Delay (s)		22.2	22.4	22.4	31.0	20.2	15.8	16.6	27.8	27.8	24.8	8.7	8.7		
	LOS		C	C	C	C	C	B	B	C	C	C	A	A		
	Approach Delay (s)			22.4			19.5			25.6			14.2			
	Approach LOS			C			B			C			B		20.0	C
7	Westwood & Range	Sig														
	Volume (vph)		21	117	109	3	228	184	60	148	6	127	277	38		
	V/C Ratio		0.1	0.3	0.3	0.0	0.6	0.6	0.2	0.3	0.3	0.3	0.5	0.5		
	Q-length (m) (95%)		3.7	13.1	13.1	1.1	32.1	32.1	7.8	14.4	14.4	13.6	27.7	27.7		
	Delay (s)		6.2	6.7	6.7	5.8	9.2	9.2	7.7	7.6	7.6	8.1	9.1	9.1		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			6.6			9.1			7.6			8.8			
	Approach LOS			A			A			A			A		8.3	A
8	Massey & Pine Centre Frontage	Unsig														
	Volume (vph)			670	123	443	612		0		205					
	V/C Ratio			0.2	0.1	0.6	0.2				0.4					
	Q-length (m) (95%)			0.0	0.0	34.9	0.0				12.8					
	Delay (s)			0.0	0.0	16.2	0.0				13.4					
	LOS			A	A	C	A				B					
	Approach Delay (s)			0.0			6.8			13.4						
	Approach LOS			A			A			B					4.8	A
9	Hwy 97 Ramp & Hwy 97 On-ramp	Unsig														
	Volume (vph)		0	0			410	443				0		101		
	V/C Ratio						0.3	0.3						0.2		
	Q-length (m) (95%)						0.0	0.0						4.9		
	Delay (s)						0.0	0.0						12.2		
	LOS						A	A						B		
	Approach Delay (s)						0.0						12.2			
	Approach LOS						A						B		1.3	A

2008+15 PM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
10	Rec Place & Ferry	Sig														
	Volume (vph)		159	409	264	724	556	192	178	216	254	337	13	140		
	V/C Ratio		0.6	0.6	0.2	1.1	0.7	0.7	0.3	0.5	0.4	1.2	0.2	0.2		
	Q-length (m) (95%)		24.2	48.3	13.6	#113.9	75.6	75.6	34.8	53.5	35.8	#65.1	6.2	12.1		
	Delay (s)		38.4	31.8	11.6	104.5	27.7	27.7	16.9	26.4	14.5	147.1	37.7	31.1		
	LOS		D	C	B	F	C	C	B	C	B	F	D	C		
	Approach Delay (s)			26.6			65.5			19.1			111.0			
	Approach LOS			C			E			B			F		53.9	D
11	Wiebe & Range	Sig														
	Volume (vph)		29	113	95	55	170	23	143	67	13	72	27	104		
	V/C Ratio		0.1	0.2	0.2	0.1	0.2	0.2	0.5	0.2	0.2	0.3	0.2	0.2		
	Q-length (m) (95%)		3.4	10.5	10.5	5.3	12.7	12.7	10.1	5.8	5.8	5.9	5.4	5.4		
	Delay (s)		3.5	3.8	3.8	3.6	3.8	3.8	9.8	8.7	8.7	9.0	8.5	8.5		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			3.8			3.8			9.4			8.7			
	Approach LOS			A			A			A			A		6.2	A
12	Westwood & Athlone	Unsig														
	Volume (vph)					38		76		813	28	221	719			
	V/C Ratio					0.3		0.3		0.5	0.5	0.3	0.5			
	Q-length (m) (95%)					7.7		7.7		0.0	0.0	10.6	0.0			
	Delay (s)					24.3		24.3		0.0	0.0	12.1	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						24.3			0.0			2.8			
	Approach LOS						C			A			A		2.9	A
13	Anthem & Ferry	Unsig														
	Volume (vph)		0	1397			802	87				0		65		
	V/C Ratio			0.5			0.2	0.1						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						2.4		
	Delay (s)			0.0			0.0	0.0						10.4		
	LOS			A			A	A						B		
	Approach Delay (s)			0.0			0.0						10.4			
	Approach LOS			A			A						B		0.3	A
14	Westwood & Fairview	Unsig														
	Volume (vph)					4		8		832	13	13	745			
	V/C Ratio					0.0		0.0		0.5	0.5	0.0	0.5			
	Q-length (m) (95%)					0.6		0.6		0.0	0.0	0.4	0.0			
	Delay (s)					16.6		16.6		0.0	0.0	9.9	0.0			
	LOS					C		C		A	A	A	A			
	Approach Delay (s)						16.6			0.0			0.2			
	Approach LOS						C			A			A		0.2	A

2008+15 PM Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
15	Westwood & Laurel	Unsig														
	Volume (vph)					8		13		832	16	12	738			
	V/C Ratio					0.0		0.0		0.5	0.5	0.0	0.5			
	Q-length (m) (95%)					1.0		1.0		0.0	0.0	0.5	0.0			
	Delay (s)					17.3		17.3		0.0	0.0	10.5	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						17.3			0.0			0.2			
	Approach LOS						C			A			A	0.3		A
16	Ryan & Ferry	Unsig														
	Volume (vph)		61	692	48	63	732	80	45	0	73	68	0	74		
	V/C Ratio		0.1	0.3	0.3	0.1	0.3	0.3	0.2	0.2	0.2	0.4	0.4	0.4		
	Q-length (m) (95%)		2.0	0.0	0.0	2.0	0.0	0.0	6.8	6.8	6.8	12.8	12.8	12.8		
	Delay (s)		2.3	0.0	0.0	2.3	0.0	0.0	17.3	17.3	17.3	21.4	21.4	21.4		
	LOS		A	A	A	A	A	A	C	C	C	C	C	C		
	Approach Delay (s)			1.2			1.1			17.3			21.4			
	Approach LOS			A			A			C			C	2.8		A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

During the Saturday midday hour, summarized in Table 5.7, all approaches and intersections are expected to operate at LOS “C” or better, with the exception of the following:

- At the intersection of Highway 16 and Highway 97, the westbound, northbound, and southbound approaches operate at LOS “E”, “F”, and “F” respectively, and the intersection as a whole operates at LOS “E”. The westbound left, the northbound left and the southbound through movements all have v/c ratios of 1.0 or greater, indicating that these movements are over capacity.
- At the intersection of Highway 16 and Ferry Avenue the eastbound and westbound approaches are at LOS “E”, the northbound and southbound approaches are at LOS “D”. The intersection as a whole operates at a LOS “E”. The eastbound left, the westbound through, the northbound left and the southbound through movements have v/c ratios of 1.0 indicating that these movements is at capacity.
- At the intersection of Westwood Drive and Massey Drive the intersection and the eastbound, westbound, and northbound approaches operate at LOS “D”, and the southbound approach operates at LOS “E”. The northbound left, southbound through and southbound right turn movements all have v/c ratios of 1.0 indicating that these movements are at capacity.
- At the intersection of Westwood Drive and Ferry Avenue the northbound approach experiences delays and queues resulting in LOS “D”. The northbound through and northbound right movements have v/c ratios of 0.9 indicating that each of these movements are near capacity.
- At the intersection of Rec Place Drive and Ferry Avenue all approaches operate poorly with the eastbound and westbound approaches at LOS “E”, the northbound and southbound approaches at LOS “D” and “F” respectively, and the intersection as a whole operates at a LOS “E”. Numerous movements have v/c ratios in excess of 1.0 including the eastbound through, westbound left and southbound through movements.
- At the unsignalized site access points of Westwood Drive and Athlone Avenue, and Ryan Road and Ferry Avenue, poorer LOS are experienced for the outbound movements. The westbound approach at Westwood Drive and Athlone Avenue, and the southbound approach at Ryan Road and Ferry Avenue operate at LOS “E”; however, these intersections as a whole continue to operate well.
- At the unsignalized intersection of Highway 16 and Playhouse Access, and Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movements at LOS “F” and “E” respectively.

Table 5.7: 2023 Saturday Midday Peak Hour Background+ Site Development Scenario II

2008+15 Sat Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		89	484	1445	140	500	131	668	884	34	91	1430	58		
	V/C Ratio		0.7	0.7	0.9	1.0	0.8	0.1	1.3	0.8	0.0	0.3	1.2	0.1		
	Q-length (m) (95%)		34.5	92.6	0	#70.1	96.5	22.1	#179.9	145.8	3.4	44.7	#325.2	14.8		
	Delay (s)		54.4	56.0	8.5	117.2	57.7	23.5	219.2	48.5	27.9	44.7	126.7	23.3		
	LOS		D	E	A	F	E	C	F	D	C	D	F	C		
	Approach Delay (s)			21.9			62.7			120.0			118.1			
	Approach LOS			C			E			F			F		78.8	E
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		260				65	1755			2184	844		
	V/C Ratio				1.5				0.3	0.6			0.7	0.5		
	Q-length (m) (95%)				133.3				10.4	0.0			0.0	0.0		
	Delay (s)				294.7				30.0	0.0			0.0	0.0		
	LOS				F				D	A			A	A		
	Approach Delay (s)				294.7					1.1			0.0			
	Approach LOS				F					A			A		15.4	C
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		619	335	366	329	484	43	578	1021	266	81	1280	830		
	V/C Ratio		1.0	0.7	0.8	0.5	1.0	0.1	1.0	0.8	0.2	0.6	1.0	0.5		
	Q-length (m) (95%)		#143.7	69.3	68.2	64.6	#115.4	18.1	#136.2	171.5	18.8	23.1	#186.0	0		
	Delay (s)		94.7	65.4	50.2	47.4	86.1	45.8	97.5	39.6	10.5	42.4	82.6	1.1		
	LOS		F	E	D	D	F	D	F	D	B	D	F	A		
	Approach Delay (s)				75.0		69.2			53.4			50.2			
	Approach LOS				E		E			D			D		59.0	E
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		192				83	1590			1545	304		
	V/C Ratio				0.7				0.3	0.5			0.5	0.2		
	Q-length (m) (95%)				37.9				7.6	0.0			0.0	0.0		
	Delay (s)				41.2				18.4	0.0			0.0	0.0		
	LOS				E				C	A			A	A		
	Approach Delay (s)				41.2					0.9			0.0			
	Approach LOS				E					A			A		2.5	A

2008+15 Sat Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		70	384	344	109	225	29	490	272	273	208	493	71		
	V/C Ratio		0.4	0.8	0.5	0.8	0.5	0.5	1.0	0.2	0.3	0.7	1.0	1.0		
	Q-length (m) (95%)		26.4	70.4	67.7	38.4	45.1	45.1	#177.3	37.6	42.8	40.7	104.9	104.9		
	Delay (s)		42.7	57.6	21.1	69.7	47.8	47.8	82.9	22.7	19.4	38.7	74.7	74.7		
	LOS		D	E	C	E	D	D	F	C	B	D	E	E		
	Approach Delay (s)			40.5			54.4			50.3			65.0			
	Approach LOS			D			D			D			E		52.0	D
6	Westwood & Ferry	Sig														
	Volume (vph)		77	436	11	74	435	490	20	447	160	331	343	62		
	V/C Ratio		0.5	0.6	0.6	0.5	0.5	0.6	0.1	0.9	0.9	0.8	0.3	0.3		
	Q-length (m) (95%)		20.9	40.4	40.4	20.2	39.1	46	5.9	#134.6	#134.6	#67.3	38.2	38.2		
	Delay (s)		25.3	24.9	24.9	25.3	24.1	17.4	13.9	36.8	36.8	28.1	6.8	6.8		
	LOS		C	C	C	C	C	B	B	D	D	C	A	A		
	Approach Delay (s)			25.0			20.9			36.1			16.4			
	Approach LOS			C			C			D			B		23.8	C
7	Westwood & Range	Sig														
	Volume (vph)		31	178	79	3	248	424	95	227	3	174	190	9		
	V/C Ratio		0.1	0.2	0.2	0.0	0.6	0.6	0.3	0.5	0.5	0.6	0.4	0.4		
	Q-length (m) (95%)		5.1	19	19	1	#63.2	#63.2	13.2	25.9	25.9	23.7	22.5	22.5		
	Delay (s)		4.5	4.7	4.7	4.1	7.5	7.5	11.2	11.7	11.7	14.9	11.4	11.4		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			4.7			7.5			11.6			13.0			
	Approach LOS			A			A			B			B		9.0	A
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			709	183	575	434		0		308					
	V/C Ratio			0.2	0.1	0.7	0.1				0.4					
	Q-length (m) (95%)			0.0	0.0	42.1	0.0				16.5					
	Delay (s)			0.0	0.0	16.8	0.0				13.0					
	LOS			A	A	C	A				B					
	Approach Delay (s)			0.0			9.6			13.0						
	Approach LOS			A			A			B					6.2	A
9	Hwy 97 Ramp & Hwy 97 On-ramp	Unsig					1	2	6	7	8	11	12	3		
	Volume (vph)		0	0			515	496				0		101		
	V/C Ratio						0.3	0.3						0.2		
	Q-length (m) (95%)						0.0	0.0						5.9		
	Delay (s)						0.0	0.0						13.6		
	LOS						A	A						B		
	Approach Delay (s)						0.0						13.6			
	Approach LOS						A						B		1.2	A

2008+15 Sat Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
10	Rec Place & Ferry	Sig														
	Volume (vph)		238	435	355	984	641	289	219	286	320	451	21	263		
	V/C Ratio		0.8	1.1	0.4	1.1	0.9	0.9	0.5	0.9	0.5	1.1	0.1	0.6		
	Q-length (m) (95%)		46.9	#89.4	20.8	#163.9	136.2	136.2	60.2	#107.2	62.4	#90.4	11.7	51.9		
	Delay (s)		69.8	113.1	29.1	96.9	48.9	48.9	28.5	66.5	18.7	113.7	51.2	49.4		
	LOS		E	F	C	F	D	D	C	E	B	F	D	D		
	Approach Delay (s)			74.0			73.6			37.9			88.9			
	Approach LOS			E			E			D			F		69.6	E
11	Wiebe & Range	Sig														
	Volume (vph)		42	140	192	28	259	34	311	96	31	91	35	133		
	V/C Ratio		0.1	0.4	0.4	0.1	0.4	0.4	0.7	0.2	0.2	0.2	0.2	0.2		
	Q-length (m) (95%)		6.1	18.7	18.7	4.4	25.9	25.9	#37.3	11.4	11.4	10.7	9.2	9.2		
	Delay (s)		7.2	8.1	8.1	7.0	8.3	8.3	11.8	6.6	6.6	6.8	6.6	6.6		
	LOS		A	A	A	A	A	A	B	A	A	A	A	A		
	Approach Delay (s)			8.0			8.2			10.4			6.7			
	Approach LOS			A			A			B			A		8.5	A
12	Westwood & Athlone	Unsig				1		1		2	2	3	4			
	Volume (vph)					46		95		987	36	299	692			
	V/C Ratio					0.5		0.5		0.7	0.7	0.5	0.4			
	Q-length (m) (95%)					19.7		19.7		0.0	0.0	22.7	0.0			
	Delay (s)					41.9		41.9		0.0	0.0	16.7	0.0			
	LOS					E		E		A	A	C	A			
	Approach Delay (s)						41.9			0.0			5.0			
	Approach LOS						E			A			A		5.1	A
13	Anthem & Ferry	Unsig		1			3	6.0						7.0		
	Volume (vph)		0	1320			798	135				0		93		
	V/C Ratio			0.4			0.2	0.2						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						3.8		
	Delay (s)			0.0			0.0	0.0						10.9		
	LOS			A			A	A						B		
	Approach Delay (s)			0.0			0.0						10.9			
	Approach LOS			A			A						B		0.4	A
14	Westwood & Fairview	Unsig				1		1		2	2	3	4			
	Volume (vph)					6		13		1010	12	11	726			
	V/C Ratio					0.1		0.1		0.7	0.7	0.0	0.5			
	Q-length (m) (95%)					1.3		1.3		0.0	0.0	0.4	0.0			
	Delay (s)					19.7		19.7		0.0	0.0	10.8	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						19.7			0.0			0.2			
	Approach LOS						C			A			A		0.3	A

2008+15 Sat Peak Hour Background+Site+2 Connections with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
15	Westwood & Laurel	Unsig				1		1		2	2	3	4			
	Volume (vph)					12		21		1001	13	10	723			
	V/C Ratio					0.1		0.1		0.7	0.7	0.0	0.5			
	Q-length (m) (95%)					2.4		2.4		0.0	0.0	0.5	0.0			
	Delay (s)					21.9		21.9		0.0	0.0	11.9	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						21.9			0.0			0.2			
	Approach LOS						C			A			A		0.5	A
16	Ryan & Ferry	Unsig														
	Volume (vph)		75	845	62	82	942	99	58	0	95	88	0	97		
	V/C Ratio		0.1	0.3	0.3	0.1	0.4	0.4	0.4	0.4	0.4	0.7	0.7	0.7		
	Q-length (m) (95%)		3.2	0.0	0.0	3.1	0.0	0.0	15.8	15.8	15.8	38.7	38.7	38.7		
	Delay (s)		3.3	0.0	0.0	3.1	0.0	0.0	24.8	24.8	24.8	45.3	45.3	45.3		
	LOS		A	A	A	A	A	A	C	C	C	E	E	E		
	Approach Delay (s)				1.7			1.5		24.8			45.3			
	Approach LOS				A			A		C			E		5.2	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

5.2.3 Scenario III – 2023 Full Development of PGGCC Lands: Highway 97 Connection Only

Network Description

This scenario represents intersection conditions with the full development of the PGGCC lands including internal roadway connection to Highway 97 via an underpass. The poor operating conditions at the unsignalized intersections of Westwood Drive at Range Road, Wiebe Road at Range Road, and Ryan Road at Ferry Avenue resulted in the addition of signal control to these intersections. The following signal timing and geometric improvements were required to improve operations, and are assumed in place.

Signalization of the following intersections:

- Westwood Drive and Range Road
- Wiebe Road and Range Road
- Ryan Road and Ferry Avenue

Geometric changes required:

- Free-flow eastbound right turn lane from Highway 97 to Highway 16 with long downstream merge
- Three southbound through lanes at Highway 16 and Ferry Avenue with long downstream merge
- Free-flow southbound right turn lane from Highway 16 to Ferry Avenue with long downstream merge
- Dual northbound left turn lanes from Highway 16 to Ferry Avenue in protected phase with 140 m storage
- Dual eastbound left turn lanes and westbound left turn lanes from Ferry Avenue to Rec Place Drive in protected phase with 90 m EB and 120 m WB storage respectively, and long downstream merge
- Dual southbound left turn lanes from Rec Place Drive to Ferry Avenue in protected phase with 90 m storage
- Exclusive northbound left turn lane from Rec Place Drive to Ferry Avenue in protected-permissive phase with 100 m storage
- Exclusive eastbound right turn lane from Ferry Avenue to Rec Place Drive with 50 m storage
- Exclusive northbound right turn lane and southbound right turn lane from Rec Place Drive to Ferry Avenue with 90 m NB and 30 m SB storage respectively
- Two-way left turn lane on Westwood Drive between Pine Centre Mall South Access and Ferry Avenue
- Increase northbound left turn lane storage to 170 m at Highway 16 and Highway 97
- Increase eastbound left turn lane storage to 80 m at Highway 16 and Ferry Avenue
- Increase eastbound right turn lane storage to 70 m at Highway 16 and Ferry Avenue
- Increase westbound right turn lane storage to 30 m at Westwood Drive and Athlone Avenue
- Increase northbound right turn lane and southbound right turn lane storage to 30 m at Ryan Road and Ferry Avenue
- Increase northbound left turn lane and southbound left turn lane storage to 30 m at Westwood Drive and Range Road

- Increase eastbound left turn lane and westbound left turn lane storage to 30 m at Range Road and Wiebe Road
- Increase northbound left turn lane storage to 40 m at Range Road and Wiebe Road

Signal timing modifications (optimization) are required at the following intersections:

- Highway 16 and Highway 97
- Highway 16 and Ferry Avenue
- Rec Place Drive and Ferry Avenue
- Westwood Drive and Ferry Avenue
- Westwood Drive and Massey
- New phasing with a permissive-overlay for eastbound right, northbound right, and southbound right at Rec Place Drive and Ferry Avenue

With these new network improvements, the combined network travel times for the three peak hours decreases from 3,600 vehicle hours to 1,600 vehicle hours.

Traffic Operation Conditions

The morning peak hour results of the analysis summarized in Table 5.8 indicate that all intersection and approaches within the study area operate at a LOS of “C” or better, except for the following.

- At the intersection of Highway 16 and Highway 97 the northbound and southbound approaches are at LOS “F” and “D” respectively, and the intersection as a whole is at LOS “D”. The northbound left turn movement has a v/c ratio of 1.2; meaning that this movement is over capacity and it also operates with a LOS of “F”.
- At the intersection of Highway 16 and Ferry Avenue the eastbound, westbound, and northbound approaches are at LOS “D”, “E”, and “D” respectively, and the intersection as a whole is at LOS “D”. The northbound through has a v/c ratio of 1.0, which indicates that this movement is at capacity, and this movement is expected to operate at a LOS of “D”.

For the PM Peak hour, summarized in Table 5.9, the results indicate that acceptable level of service of “C” or better for all approaches and intersections with the exception of the following:

- At the intersection of Highway 97 and Highway 16, except for the eastbound approach, all other approaches are at LOS “F”, and the intersection as a whole is at LOS “E”. The addition of site traffic exacerbates the poor existing conditions. The westbound left, westbound through, northbound left, and southbound through movements all have v/c ratios of 1.0 or greater which indicates that these movements are over capacity.
- At the intersection of Highway 16 and Ferry Avenue, the eastbound and westbound approaches have a LOS “F” and northbound and southbound approaches have a LOS “D” and “E” respectively. This intersection as a whole operates at LOS “E”. The eastbound left, eastbound right, westbound left, westbound through, northbound left and the southbound through have v/c ratios of 1.0 or greater indicating that these movements are over capacity.
- At Westwood Drive and Massey Drive; southbound approach operates at LOS “D”.

Table 5.8: 2023 AM Peak Hour Background + Site (Scenario III)

2008+15 AM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		20	688	513	79	578	106	590	646	88	115	392	23		
	V/C Ratio		0.1	0.7	0.4	0.4	0.6	0.1	1.2	0.8	0.1	0.6	0.6	0.0		
	Q-length (m) (95%)		7.8	101	0	22.1	83	6.9	#133.1	92.5	7.3	#51.1	57.2	5.3		
	Delay (s)		22.8	34.0	0.6	22.5	28.6	15.5	160.6	40.6	24.8	48.6	38.2	29.8		
	LOS		C	C	A	C	C	B	F	D	C	D	D	C		
	Approach Delay (s)			19.8			26.1			93.0			40.1			
	Approach LOS			B			C			F			D		49.1	D
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		40				17	1657			748	254		
	V/C Ratio				0.1				0.0	0.6			0.2	0.3		
	Q-length (m) (95%)				2.1				0.6	0.0			0.0	0.0		
	Delay (s)				12.0				9.8	0.0			0.0	0.0		
	LOS				B				A	A			A	A		
	Approach Delay (s)				12.0					0.1			0.0			
	Approach LOS				B					A			A		0.2	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		193	276	128	396	276	79	221	1556	690	67	455	166		
	V/C Ratio		0.6	0.6	0.1	0.9	0.5	0.2	0.6	1.0	0.6	0.5	0.2	0.1		
	Q-length (m) (95%)		37.1	49.2	9.6	#82.6	48	24.1	41.3	#265.7	69.2	17.7	37.5	0		
	Delay (s)		53.7	51.6	35.0	70.0	45.2	37.5	53.6	48.2	14.4	28.9	22.2	0.1		
	LOS		D	D	D	E	D	D	D	D	B	C	C	A		
	Approach Delay (s)				48.7		57.5			39.2			17.5			
	Approach LOS				D		E			D			B		40.2	D
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		73				90	2203			873	49		
	V/C Ratio				0.1				0.1	0.7			0.3	0.0		
	Q-length (m) (95%)				3.7				3.4	0.0			0.0	0.0		
	Delay (s)				12.6				10.7	0.0			0.0	0.0		
	LOS				B				B	A			A	A		
	Approach Delay (s)				12.6					0.4			0.0			
	Approach LOS				B					A			A		0.6	A

2008+15 AM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		34	464	109	90	268	11	224	159	297	123	171	63		
	V/C Ratio		0.1	0.5	0.1	0.3	0.3	0.3	0.6	0.2	0.3	0.4	0.4	0.4		
	Q-length (m) (95%)		7.3	43.3	7.2	15.3	26.2	26.2	#42.8	18.3	29.6	23.2	22.5	22.5		
	Delay (s)		16.9	21.4	12.9	13.0	16.9	16.9	21.4	22.6	18.7	22.8	26.2	26.2		
	LOS		B	C	B	B	B	B	C	C	B	C	C	C		
	Approach Delay (s)			19.6			15.9			20.5			25.0			
	Approach LOS			B			B			C			C		20.2	C
6	Westwood & Ferry	Sig														
	Volume (vph)		44	250	81	66	185	220	55	304	90	113	192	23		
	V/C Ratio		0.2	0.5	0.5	0.4	0.3	0.2	0.2	0.7	0.7	0.3	0.2	0.2		
	Q-length (m) (95%)		12	25.8	25.8	16.9	17.5	9.4	11.4	64.4	64.4	12.6	21.7	21.7		
	Delay (s)		17.6	18.6	18.6	19.0	17.4	12.6	12.4	18.8	18.8	7.6	6.2	6.2		
	LOS		B	B	B	B	B	B	B	B	B	A	A	A		
	Approach Delay (s)			18.5			15.4			18.0			6.6			
	Approach LOS			B			B			B			A		15.1	B
7	Westwood & Range	Sig														
	Volume (vph)		73	58	41	1	59	89	40	144	1	43	94	16		
	V/C Ratio		0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.4	0.4	0.2	0.3	0.3		
	Q-length (m) (95%)		5.4	5.1	5.1	0.4	6	6	3.3	8.7	8.7	3.4	6.4	6.4		
	Delay (s)		3.5	3.4	3.4	3.2	3.5	3.5	8.3	9.3	9.3	8.4	8.8	8.8		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			3.5			3.5			9.1			8.7			
	Approach LOS			A			A			A			A		6.3	A
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			715	79	110	325		0		34					
	V/C Ratio			0.3	0.1	0.2	0.1				0.1					
	Q-length (m) (95%)			0.0	0.0	4.5	0.0				1.5					
	Delay (s)			0.0	0.0	10.3	0.0				10.5					
	LOS			A	A	B	A				B					
	Approach Delay (s)			0.0			2.6			10.5						
	Approach LOS			A			A			B					1.2	A

2008+15 AM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
9	Hwy 97 Ramp & Hwy 97 On-ramp	Unsig					1	2	6	7	8	11	12	3		
	Volume (vph)		0	0			94	275				0		101		
	V/C Ratio						0.1	0.2						0.1		
	Q-length (m) (95%)						0.0	0.0						3.0		
	Delay (s)						0.0	0.0						9.3		
	LOS						A	A						A		
	Approach Delay (s)						0.0						9.3			
	Approach LOS						A						A		2.0	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		84	381	91	211	359	65	29	65	64	128	1	50		
	V/C Ratio		0.4	0.5	0.5	0.5	0.4	0.4	0.1	0.3	0.3	0.4	0.0	0.0		
	Q-length (m) (95%)		11	31	31	22.5	31.3	31.3	7	16.5	16.5	15.7	1	1		
	Delay (s)		25.9	18.6	18.6	23.8	15.8	15.8	15.3	24.4	24.4	24.4	24.9	24.9		
	LOS		C	B	B	C	B	B	B	C	C	C	C	C		
	Approach Delay (s)			18.3			18.4			19.4			23.4			
	Approach LOS			B			B			B			C		20.1	C
11	Wiebe & Range	Sig														
	Volume (vph)		9	66	31	26	113	7	21	20	6	19	7	28		
	V/C Ratio		0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.3	0.3	0.2	0.1	0.1		
	Q-length (m) (95%)		1	4.1	4.1	1.9	5.7	5.7	2	2.2	2.2	1.9	2.1	2.1		
	Delay (s)		1.7	1.8	1.8	1.7	1.8	1.8	13.0	13.4	13.4	13.1	12.5	12.5		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			1.8			1.8			13.2			12.7			
	Approach LOS			A			A			B			B		5.0	A
12	Westwood & Athlone	Unsig				1		1		2	2	3	4			
	Volume (vph)					30		79		600	25	43	323			
	V/C Ratio					0.2		0.2		0.4	0.4	0.1	0.2			
	Q-length (m) (95%)					5.2		5.2		0.0	0.0	1.2	0.0			
	Delay (s)					14.5		14.5		0.0	0.0	9.2	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						14.5			0.0			1.1			
	Approach LOS						B			A			A		1.8	A

2008+15 AM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
13	Anthem & Ferry	Unsig		1			3	6.0						7.0		
	Volume (vph)		0	597			382	53				0		32		
	V/C Ratio			0.2			0.1	0.1						0.0		
	Q-length (m) (95%)			0.0			0.0	0.0						0.9		
	Delay (s)			0.0			0.0	0.0						9.2		
	LOS			A			A	A						A		
	Approach Delay (s)			0.0			0.0						9.2			
	Approach LOS			A			A						A		0.3	A
14	Westwood & Fairview	Unsig				1		1		2	2	3	4			
	Volume (vph)					10		21		604	3	3	350			
	V/C Ratio					0.1		0.1		0.4	0.4	0.0	0.2			
	Q-length (m) (95%)					1.2		1.2		0.0	0.0	0.1	0.0			
	Delay (s)					13.1		13.1		0.0	0.0	8.9	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						13.1			0.0			0.1			
	Approach LOS						B			A			A		0.4	A
15	Westwood & Laurel	Unsig				1		1		2	2	3	4			
	Volume (vph)					18		31		577	4	3	357			
	V/C Ratio					0.1		0.1		0.4	0.4	0.0	0.2			
	Q-length (m) (95%)					1.7		1.7		0.0	0.0	0.1	0.0			
	Delay (s)					13.0		13.0		0.0	0.0	8.9	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						13.0			0.0			0.1			
	Approach LOS						B			A			A		0.7	A
16	Ryan & Ferry	Sig														
	Volume (vph)		17	494	14	18	417	22	18	0	30	33	0	36		
	V/C Ratio		0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.0	0.0	0.2	0.0	0.0		
	Q-length (m) (95%)		12.3	12.3	12.3	10.5	10.5	10.5	2.9	0	0	4.2	0	0		
	Delay (s)		2.5	2.5	2.5	2.4	2.4	2.4	12.4	12.0	12.0	12.8	12.0	12.0		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			2.5			2.4			12.1			12.4			
	Approach LOS			A			A			B			B		3.5	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Table 5.9: 2023 PM Peak Hour Background + Site (Scenario III)

2008+15 PM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		71	634	1262	183	841	156	517	701	60	146	1491	41		
	V/C Ratio		0.6	0.8	0.8	1.3	1.0	0.1	1.2	0.8	0.0	0.3	1.1	0.1		
	Q-length (m) (95%)		#29.3	123.6	0	#101.5	#190.7	18	#138.9	123.8	4.7	61	#324.8	13		
	Delay (s)		51.4	61.2	3.2	207.8	97.5	17.7	186.4	56.4	35.3	41.9	110.3	23.6		
	LOS		D	E	A	F	F	B	F	E	D	D	F	C		
	Approach Delay (s)			23.7			104.0			108.0			102.2			
	Approach LOS			C			F			F			F		78.5	E
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		156				49	1317			2442	626		
	V/C Ratio				1.0				0.3	0.4			0.6	0.7		
	Q-length (m) (95%)				58.6				10.3	0.0			0.0	0.0		
	Delay (s)				115.7				38.1	0.0			0.0	0.0		
	LOS				F				E	A			A	A		
	Approach Delay (s)				115.7					1.4			0.0			
	Approach LOS				F					A			A		4.3	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		545	397	453	780	606	64	360	867	219	91	1618	691		
	V/C Ratio		1.0	0.8	1.2	1.0	1.0	0.1	1.0	0.7	0.2	0.5	1.1	0.4		
	Q-length (m) (95%)		#118.2	75.5	#163.5	#174.8	#127.8	21.7	#88.8	136	14.2	25.1	#215.6	0		
	Delay (s)		83.3	61.4	151.6	93.7	74.9	38.1	110.5	37.9	11.4	30.8	80.8	0.7		
	LOS		F	E	F	F	E	D	F	D	B	C	F	A		
	Approach Delay (s)				99.2		83.4			51.9			55.8			
	Approach LOS				F		F			D			E		70.0	E
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		182				68	1439			2492	216		
	V/C Ratio				1.4				0.5	0.5			0.8	0.1		
	Q-length (m) (95%)				94.4				16.5	0.0			0.0	0.0		
	Delay (s)				260.3				46.5	0.0			0.0	0.0		
	LOS				F				E	A			A	A		
	Approach Delay (s)				260.3					2.1			0.0			
	Approach LOS				F					A			A		11.5	B

2008+15 PM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		56	330	203	321	519	60	416	263	252	125	318	85		
	V/C Ratio		0.3	0.6	0.2	0.8	0.6	0.6	0.8	0.2	0.2	0.4	0.6	0.6		
	Q-length (m) (95%)		15.9	49.2	17.1	#88.0	75	75	#104.4	29.4	15.3	25.2	54.7	54.7		
	Delay (s)		31.3	38.2	18.3	30.8	30.7	30.7	27.7	22.3	12.5	31.3	39.8	39.8		
	LOS		C	D	B	C	C	C	C	C	B	C	D	D		
	Approach Delay (s)			30.7			30.7			22.1			37.8			
	Approach LOS			C			C			C			D		29.2	C
6	Westwood & Ferry	Sig														
	Volume (vph)		86	390	96	86	409	378	114	368	113	243	370	93		
	V/C Ratio		0.6	0.7	0.7	0.7	0.5	0.6	0.5	0.9	0.9	0.8	0.5	0.5		
	Q-length (m) (95%)		22.7	40.7	40.7	#28.6	35.7	36	24	#96.9	#96.9	#45.4	49.8	49.8		
	Delay (s)		24.7	22.9	22.9	33.2	20.7	16.8	16.5	28.9	28.9	27.6	8.7	8.7		
	LOS		C	C	C	C	C	B	B	C	C	C	A	A		
	Approach Delay (s)			23.2			20.2			26.5			15.2			
	Approach LOS			C			C			C			B		20.9	C
7	Westwood & Range	Sig														
	Volume (vph)		21	117	109	3	228	184	60	158	6	129	283	38		
	V/C Ratio		0.1	0.3	0.3	0.0	0.6	0.6	0.2	0.3	0.3	0.4	0.5	0.5		
	Q-length (m) (95%)		3.7	13.1	13.1	1.1	32.1	32.1	7.8	15.2	15.2	13.8	28.5	28.5		
	Delay (s)		6.2	6.7	6.7	5.9	9.2	9.2	7.7	7.6	7.6	8.0	9.1	9.1		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			6.7			9.2			7.6			8.8			
	Approach LOS			A			A			A			A		8.3	A
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			690	127	443	668		0		205					
	V/C Ratio			0.2	0.1	0.7	0.2				0.4					
	Q-length (m) (95%)			0.0	0.0	36.7	0.0				13.3					
	Delay (s)			0.0	0.0	16.9	0.0				13.7					
	LOS			A	A	C	A				B					
	Approach Delay (s)			0.0			6.7			13.7						
	Approach LOS			A			A			B					4.8	A

2008+15 PM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
9	Hwy 97 Ramp & Hwy 97 On-ramp	Unsig					1	2	6	7	8	11	12	3		
	Volume (vph)		0			7				14						
	V/C Ratio						0.0				13.7					
	Q-length (m) (95%)						0.0				13.7					
	Delay (s)						0.0				13.7					
	LOS						A				B					
	Approach Delay (s)						0.0			13.7						
	Approach LOS						A			B					0.0	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		172	409	264	724	575	202	178	216	254	334	13	172		
	V/C Ratio		0.6	0.7	0.7	1.1	0.7	0.7	0.4	0.6	0.6	1.2	0.1	0.1		
	Q-length (m) (95%)		#29.7	60.7	60.7	#121.1	84.7	84.7	34.4	64.5	64.5	#68.1	13.2	13.2		
	Delay (s)		39.8	32.5	32.5	105.1	26.6	26.6	18.1	30.5	30.5	143.6	27.1	27.1		
	LOS		D	C	C	F	C	C	B	C	C	F	C	C		
	Approach Delay (s)			30.5			64.5			21.9			101.2			
	Approach LOS			C			E			C			F		55.8	E
11	Wiebe & Range	Sig														
	Volume (vph)		29	114	96	55	170	23	143	67	13	72	27	104		
	V/C Ratio			0.3	0.3		0.3	0.3		0.6	0.6		0.3	0.3		
	Q-length (m) (95%)			17	17		22.9	22.9		20.5	20.5		10.2	10.2		
	Delay (s)			5.4	5.4		5.7	5.7		10.7	10.7		8.5	8.5		
	LOS			A	A		A	A		B	B		A	A		
	Approach Delay (s)			5.4			5.7			10.5			8.0			
	Approach LOS			A			A			B			A		4.6	A
12	Westwood & Athlone	Unsig				1		1		2	2	3	4			
	Volume (vph)					37		96		823	61	107	725			
	V/C Ratio					0.3		0.3		0.6	0.6	0.2	0.5			
	Q-length (m) (95%)					10.4		10.4		0.0	0.0	4.4	0.0			
	Delay (s)					21.9		21.9		0.0	0.0	11.0	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						21.9			0.0			1.4			
	Approach LOS						C			A			A		2.2	A

2008+15 PM Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
13	Anthem & Ferry	Unsig		1			3	6.0						7.0		
	Volume (vph)		0	1394			802	87				0		65		
	V/C Ratio			0.5			0.2	0.1						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						2.4		
	Delay (s)			0.0			0.0	0.0						10.4		
	LOS			A			A	A						B		
	Approach Delay (s)			0.0			0.0						10.4			
	Approach LOS			A			A						B		0.3	A
14	Westwood & Fairview	Unsig				1		1		2	2	3	4			
	Volume (vph)					4		8		875	13	13	749			
	V/C Ratio					0.0		0.0		0.6	0.6	0.0	0.5			
	Q-length (m) (95%)					0.7		0.7		0.0	0.0	0.5	0.0			
	Delay (s)					17.2		17.2		0.0	0.0	10.1	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						17.2			0.0			0.2			
	Approach LOS						C			A			A		0.2	A
15	Westwood & Laurel	Unsig				1		1		2	2	3	4			
	Volume (vph)					8		13		875	16	12	742			
	V/C Ratio					0.1		0.1		0.6	0.6	0.0	0.5			
	Q-length (m) (95%)					1.1		1.1		0.0	0.0	0.5	0.0			
	Delay (s)					18.2		18.2		0.0	0.0	10.8	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						18.2			0.0			0.2			
	Approach LOS						C			A			A		0.3	A
16	Ryan & Ferry	Sig														
	Volume (vph)		61	705	48	63	782	80	45	0	73	68	0	74		
	V/C Ratio		0.3	0.3	0.3	0.2	0.2	0.2								
	Q-length (m) (95%)		0	0	0	7	7	7								
	Delay (s)		0.0	0.0	0.0	17.4	17.4	17.4								
	LOS		A	A	A	B	B	B								
	Approach Delay (s)		1.2		1.1		17.4	22.4								
	Approach LOS		A		A		B	C							8.1	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

- At the intersection of Rec Place Drive and Ferry Avenue the westbound and southbound approaches have LOS “E” and “F” respectively, and the intersection as a whole operates at a LOS “D”. The westbound left and the southbound left have v/c ratios of 1.1 and 1.2 respectively, meaning that these movements are over capacity.
- At the unsignalized intersection of Highway 16 and Playhouse Access, and Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movement at LOS “F”.

During the Saturday midday hour, summarized in Table 5.10, all approaches and intersections are expected to operate at LOS “C” or better, with the exception of the following:

- At the intersection of Highway 16 and Highway 97, all approaches operate poorly, with the eastbound, northbound, and southbound approaches experiencing a LOS “F”, and the westbound experiencing a LOS “E”. The intersection as a whole operates at LOS “F”. The eastbound right, westbound left, the northbound left and the southbound through movements all have a v/c ratio of 1.0 or greater, indicating that these movements are over capacity.
- At the intersection of Highway 16 and Ferry Avenue the eastbound and westbound approaches are at LOS “E”, the northbound and southbound approaches are at LOS “D”. The intersection as a whole operates at a LOS “E”. The eastbound left, the westbound through, the northbound left and the southbound through movements have v/c ratios of 1.0 indicating that these movements are at capacity.
- At the intersection of Westwood Drive and Massey Drive the intersection and the eastbound and northbound approaches operate at LOS “D”, and the westbound and southbound approaches operate at LOS “E”. The westbound left and northbound left turn movements all have v/c ratios of 1.0 indicating that this movement is at capacity.
- At the intersection of Westwood Drive and Ferry Avenue the northbound approach experiences delays and queues resulting in LOS “D”. The northbound through and northbound right movements have v/c ratios of 0.9 indicating that each of these movements is near capacity.
- At the intersection of Rec Place Drive and Ferry Avenue all approaches operate poorly with the eastbound, northbound and southbound approaches at LOS “F”, the westbound approaches at LOS “E”, and the intersection as a whole operates at a LOS “E”. Numerous movements have v/c ratios in excess of 1.0 including the eastbound through, westbound left, northbound left, northbound through and southbound left movements.
- At the unsignalized site access points of Westwood Drive and Athlone Avenue, poorer LOS are experienced for the outbound movements. The westbound approach at Westwood Drive and Athlone Avenue operates at LOS “D”; however, the intersection as a whole continues to operate well.
- At the unsignalized intersection of Highway 16 and Playhouse Access, and Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movements at LOS “F” and “E” respectively.

Table 5.10: 2023 Saturday Midday Peak Hour Background + Site (Scenario III)

2008+15 Sat Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		89	484	1610	140	500	121	668	884	34	91	1366	58		
	V/C Ratio		0.7	0.7	1.0	1.0	0.8	0.1	1.3	0.8	0.0	0.3	1.1	0.1		
	Q-length (m) (95%)		34.5	92.6	#57.2	#70.1	96.5	19.9	#176.2	145.8	3.4	44.7	#307.2	15		
	Delay (s)		54.4	56.0	95.6	117.2	57.7	23.3	195.7	48.5	27.9	44.7	114.3	23.9		
	LOS		D	E	F	F	E	C	F	D	C	D	F	C		
	Approach Delay (s)			85.2			63.2			110.1			106.7			
	Approach LOS			F			E			F			F		94.3	F
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		222				70	1755			2184	935		
	V/C Ratio				1.5				0.4	0.6			0.6	0.9		
	Q-length (m) (95%)				120.1				11.5	0.0			0.0	0.0		
	Delay (s)				314.0				31.0	0.0			0.0	0.0		
	LOS				F				D	A			A	A		
	Approach Delay (s)			314.0						1.2			0.0			
	Approach LOS			F						A			A		13.9	B
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		619	333	365	329	494	43	610	1026	266	79	1246	830		
	V/C Ratio		1.0	0.7	0.7	0.5	1.0	0.1	1.0	0.8	0.2	0.6	1.0	0.5		
	Q-length (m) (95%)		#143.7	69	65.9	64.6	#119.2	17.9	#142.5	174.7	18	23.2	#183.2	0		
	Delay (s)		94.7	65.5	47.8	47.3	90.6	45.2	97.3	40.5	10.7	41.8	86.5	1.1		
	LOS		F	E	D	D	F	D	F	D	B	D	F	A		
	Approach Delay (s)			74.3			71.9			54.6			51.9			
	Approach LOS			E			E			D			D		60.2	E
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		193				83	1626			1509	304		
	V/C Ratio				0.7				0.3	0.5			0.5	0.2		
	Q-length (m) (95%)				36.2				7.3	0.0			0.0	0.0		
	Delay (s)				38.7				17.8	0.0			0.0	0.0		
	LOS				E				C	A			A	A		
	Approach Delay (s)			38.7						0.9			0.0			
	Approach LOS			E						A			A		2.4	A

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2008+15 Sat Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		70	384	195	173	225	29	485	284	303	208	410	71		
	V/C Ratio		0.4	0.8	0.3	1.0	0.4	0.4	1.0	0.3	0.4	0.7	0.9	0.9		
	Q-length (m) (95%)		26.8	76.5	36.4	#64.0	45.8	45.8	#186.1	43.2	51.7	45.6	95.2	95.2		
	Delay (s)		46.8	63.9	19.6	87.3	46.1	46.1	87.9	27.0	20.1	45.2	71.7	71.7		
	LOS		D	E	B	F	D	D	F	C	C	D	E	E		
	Approach Delay (s)			48.8			62.8			52.6			63.7			
	Approach LOS			D			E			D			E		55.9	E
6	Westwood & Ferry	Sig														
	Volume (vph)		81	451	11	74	462	523	20	456	160	335	352	54		
	V/C Ratio		0.5	0.6	0.6	0.5	0.6	0.6	0.1	0.9	0.9	0.8	0.3	0.3		
	Q-length (m) (95%)		22.2	41.7	41.7	20.5	41.3	52.5	5.9	#137.7	#137.7	#68.7	38.5	38.5		
	Delay (s)		26.8	25.3	25.3	25.7	24.6	18.4	14.0	39.1	39.1	29.5	6.9	6.9		
	LOS		C	C	C	C	C	B	B	D	D	C	A	A		
	Approach Delay (s)			25.5			21.6			38.3			17.1			
	Approach LOS			C			C			D			B		24.8	C
7	Westwood & Range	Sig														
	Volume (vph)		31	178	79	3	248	424	95	236	3	177	197	9		
	V/C Ratio		0.1	0.2	0.2	0.0	0.6	0.6	0.3	0.5	0.5	0.6	0.4	0.4		
	Q-length (m) (95%)		5.1	19	19	1	#63.2	#63.2	13.2	27.1	27.1	24.5	23.2	23.2		
	Delay (s)		4.6	4.7	4.7	4.1	7.5	7.5	11.2	11.9	11.9	15.8	11.5	11.5		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			4.7			7.5			11.7			13.5			
	Approach LOS			A			A			B			B		9.2	A
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			734	189	575	498		0		308					
	V/C Ratio			0.2	0.1	0.7	0.2				0.4					
	Q-length (m) (95%)			0.0	0.0	43.9	0.0				16.5					
	Delay (s)			0.0	0.0	17.4	0.0				13.0					
	LOS			A	A	C	A				B					
	Approach Delay (s)			0.0			9.3			13.0						
	Approach LOS			A			A			B					6.1	A

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2008+15 Sat Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
9	Hwy 97 Ramp & Hwy 97 On-ramp	Unsig					1	2	6	7	8	11	12	3		
	Volume (vph)		0	0			491	530				0		101		
	V/C Ratio						0.3	0.3						0.2		
	Q-length (m) (95%)						0.0	0.0						5.7		
	Delay (s)						0.0	0.0						13.2		
	LOS						A	A						B		
	Approach Delay (s)						0.0						13.2			
	Approach LOS						A						B		1.2	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		258	435	355	984	662	310	219	286	320	447	21	302		
	V/C Ratio		0.8	1.1	1.1	1.1	0.9	0.9	1.0	1.0	1.0	1.0	0.0	0.0		
	Q-length (m) (95%)		50	#89.4	#89.4	159.6	144.4	144.4	#98.3	#114.2	#114.2	#89.0	9	9		
	Delay (s)		68.5	107.1	107.1	81.5	50.8	50.8	99.5	83.1	83.1	105.0	25.0	25.0		
	LOS		E	F	F	F	D	D	F	F	F	F	C	C		
	Approach Delay (s)			80.6			66.2			62.6			70.1			
	Approach LOS			F			E			E			E		78.1	E
11	Wiebe & Range	Sig														
	Volume (vph)		42	141	193	28	259	34	311	96	31	91	35	133		
	V/C Ratio		0.1	0.4	0.4	0.1	0.4	0.4	0.7	0.2	0.2	0.2	0.2	0.2		
	Q-length (m) (95%)		6.1	18.9	18.9	4.4	25.9	25.9	#37.3	11.4	11.4	10.7	9.2	9.2		
	Delay (s)		7.2	8.2	8.2	7.0	8.3	8.3	11.8	6.6	6.6	6.8	6.6	6.6		
	LOS		A	A	A	A	A	A	B	A	A	A	A	A		
	Approach Delay (s)			8.1			8.2			10.4			6.7			
	Approach LOS			A			A			B			A		8.5	A
12	Westwood & Athlone	Unsig				1		1		2	2	3	4			
	Volume (vph)					45		118		999	70	122	698			
	V/C Ratio					0.5		0.5		0.7	0.7	0.2	0.5			
	Q-length (m) (95%)					21.2		21.2		0.0	0.0	6.4	0.0			
	Delay (s)					32.3		32.3		0.0	0.0	12.7	0.0			
	LOS					D		D		A	A	B	A			
	Approach Delay (s)						32.3			0.0			1.9			
	Approach LOS						D			A			A		3.3	A

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2008+15 Sat Peak Hour Background+Site+Hwy 97 with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
13	Anthem & Ferry	Unsig		1			3	6.0						7.0		
	Volume (vph)		0	1316			798	135				0		93		
	V/C Ratio			0.4			0.2	0.2						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						3.8		
	Delay (s)			0.0			0.0	0.0						10.9		
	LOS			A			A	A						B		
	Approach Delay (s)			0.0			0.0						10.9			
	Approach LOS			A			A						B		0.4	A
14	Westwood & Fairview	Unsig				1		1		2	2	3	4			
	Volume (vph)					6		13		1056	12	11	732			
	V/C Ratio					0.1		0.1		0.7	0.7	0.0	0.5			
	Q-length (m) (95%)					1.4		1.4		0.0	0.0	0.5	0.0			
	Delay (s)					20.6		20.6		0.0	0.0	11.1	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						20.6			0.0			0.2			
	Approach LOS						C			A			A		0.3	A
15	Westwood & Laurel	Unsig				1		1		2	2	3	4			
	Volume (vph)					12		21		1047	13	10	729			
	V/C Ratio					0.1		0.1		0.7	0.7	0.0	0.5			
	Q-length (m) (95%)					2.7		2.7		0.0	0.0	0.5	0.0			
	Delay (s)					23.4		23.4		0.0	0.0	12.3	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						23.4			0.0			0.2			
	Approach LOS						C			A			A		0.5	A
16	Ryan & Ferry	Sig														
	Volume (vph)		75	865	62	82	1002	99	58	0	95	88	0	97		
	V/C Ratio		0.6	0.6	0.6	0.7	0.7	0.7	0.3	0.1	0.1	0.5	0.1	0.1		
	Q-length (m) (95%)		47.3	47.3	47.3	62.1	62.1	62.1	13.6	6.2	6.2	19.2	10.1	10.1		
	Delay (s)		5.0	5.0	5.0	6.0	6.0	6.0	17.4	16.1	16.1	18.6	16.2	16.2		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			5.0			6.0			16.6			17.3			
	Approach LOS			A			A			B			B		7.1	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

5.2.4 Scenario IV – 2023 Full Development of PGGCC Lands: Athlone Connection Only

Network Description

This scenario represents intersection conditions with the full development of the PGGCC lands including internal roadway connection to Athlone Avenue. The poor operating conditions at the unsignalized intersections of Westwood Drive at Range Road, Wiebe Road at Range Road, Ryan Road at Ferry Avenue and Westwood Drive at Athlone Avenue resulted in the addition of signal control to these intersections. The following signal timing and geometric improvements were required to improve operations, and are assumed in place:

Signalization of the following intersections:

- Westwood Drive and Range Road
- Wiebe Road and Range Road
- Ryan Road and Ferry Avenue
- Westwood Drive and Athlone Avenue

Geometric changes required:

- Free-flow eastbound right turn lane from Highway 97 to Highway 16 with long downstream merge
- Three southbound through lanes at Highway 16 and Highway 97
- Three southbound through lanes at Highway 16 and Ferry Avenue with long downstream merge
- Free-flow southbound right turn lane from Highway 16 to Ferry Avenue with long downstream merge
- Dual northbound left turn lanes from Highway 16 to Ferry Avenue in protected phase with 100 m storage
- Dual westbound left turn lanes from Ferry Avenue to Rec Place Drive in protected phase with 140 m storage and long downstream merge
- Dual southbound left turn lanes from Rec Place Drive to Ferry Avenue in protected phase with 100 m storage
- Exclusive northbound left turn lane from Rec Place Drive to Ferry Avenue in protected-permissive phase with 100 m storage
- Exclusive eastbound right turn lane from Ferry Avenue to Rec Place Drive with 100 m storage
- Exclusive northbound right turn lane and southbound right turn lane from Rec Place Drive to Ferry Avenue with 30 m storage
- Two northbound through lanes at Westwood Drive and Athlone Avenue
- protected-permissive southbound left at Westwood Drive and Athlone Avenue, and permissive-overlap westbound right
- dual northbound left from Westwood Drive to Massey with 110 m storage
- Two-way left turn lane on Westwood Drive between Pine Centre Mall South Access and Ferry Avenue
- Increase northbound left turn lane storage to 170 m at Highway 16 and Highway 97
- Increase eastbound left turn lane storage to 80 m at Highway 16 and Ferry Avenue
- Increase eastbound right turn lane storage to 60 m at Highway 16 and Ferry Avenue

- Increase westbound right turn lane storage to 30 m at Westwood Drive and Athlone Avenue
- Increase northbound right turn lane and southbound right turn lane storage to 30 m at Ryan Road and Ferry Avenue
- Increase northbound left turn lane and southbound left turn lane storage to 30 m at Westwood Drive and Range Road
- Increase eastbound left turn lane and westbound left turn lane storage to 30 m at Range Road and Wiebe Road
- Increase northbound left turn lane storage to 40 m at Range Road and Wiebe Road

Signal timing modifications (optimization) are required at the following intersections:

- Highway 16 and Highway 97
- Highway 16 and Ferry Avenue
- Rec Place Drive and Ferry Avenue
- Westwood Drive and Ferry Avenue
- Westwood Drive and Massey
- New phasing with a permissive-overlay for eastbound right, northbound right, and southbound right at Rec Place Drive and Ferry Avenue

With new network improvements, the combined network travel times for the three peak hours decreases from 6,500 vehicle hours to 1,600 vehicle hours.

Traffic Operation Conditions

The morning peak hour results of the analysis summarized in Table 5.11 indicate that all intersection and approaches within the study area operate at a LOS of “C” or better, except for the following.

- At the intersection of Highway 16 and Highway 97, the northbound and southbound approaches are at LOS “F” and “D” respectively, and the intersection as a whole is at LOS “D”. The northbound left turn movement has a v/c ratio of 1.3; meaning that this movement is over capacity and it also operates with a LOS of “F”.
- At the intersection of Highway 16 and Ferry Avenue, the eastbound, westbound and northbound approaches are at LOS “D”, “E”, and “D” respectively; with the intersection as a whole operating at LOS “D”. The northbound through has a v/c ratio of 1.0, which indicates that this movement is at capacity, and this movement is expected to operate at a LOS of “D”.

For the PM Peak hour, summarized in Table 5.12, the results indicate that acceptable LOS of “C” or better for all approaches and intersections with the exception of the following:

- At the intersection of Highway 97 and Highway 16, except for the eastbound approach, all other approaches are at LOS “E”, and the intersection as a whole is at LOS “E”. The addition of site traffic exacerbates the poor existing conditions. The westbound left, westbound through, northbound left, and southbound through movements all have v/c ratios of 1.0, which indicates that these movements are at capacity.

Table 5.11: 2023 AM Peak Hour Background + Site (Scenario IV)

2008+15 AM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		20	688	474	79	578	109	613	649	88	115	414	23		
	V/C Ratio		0.1	0.7	0.3	0.4	0.6	0.1	1.3	0.8	0.1	0.7	0.5	0.0		
	Q-length (m) (95%)		7.8	99.6	0	21.7	81.8	7.2	#138.1	92	8.3	#53.7	39.8	5.3		
	Delay (s)		22.4	33.3	0.5	22.0	28.0	15.6	174.6	40.0	24.5	51.4	36.1	30.0		
	LOS		C	C	A	C	C	B	F	D	C	D	D	C		
	Approach Delay (s)			20.0			25.7			100.1			39.0			
	Approach LOS			C			C			F			D		51.9	D
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		59				16	1683			748	240		
	V/C Ratio				0.1				0.0	0.6			0.2	0.3		
	Q-length (m) (95%)				3.2				0.6	0.0			0.0	0.0		
	Delay (s)				12.2				9.8	0.0			0.0	0.0		
	LOS				B				A	A			A	A		
	Approach Delay (s)				12.2					0.1			0.0			
	Approach LOS				B					A			A		0.3	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		219	277	129	396	272	79	216	1555	690	69	472	166		
	V/C Ratio		0.7	0.7	0.1	0.9	0.5	0.2	0.6	1.0	0.6	0.5	0.2	0.1		
	Q-length (m) (95%)		41	49.3	10	#82.6	48.2	24.6	40.7	#265.5	69.6	18.4	38.6	0		
	Delay (s)		53.6	51.6	35.2	70.0	46.4	38.5	53.4	48.0	14.4	29.2	22.2	0.1		
	LOS		D	D	D	E	D	D	D	D	B	C	C	A		
	Approach Delay (s)				48.9					39.1			17.7			
	Approach LOS				D					D			B		40.2	D
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		72				90	2198			891	49		
	V/C Ratio				0.1				0.1	0.7			0.3	0.0		
	Q-length (m) (95%)				3.7				3.5	0.0			0.0	0.0		
	Delay (s)				12.8				10.8	0.0			0.0	0.0		
	LOS				B				B	A			A	A		
	Approach Delay (s)				12.8					0.4			0.0			
	Approach LOS				B					A			A		0.6	A

2008+15 AM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		34	464	144	68	268	11	256	187	332	123	190	63		
	V/C Ratio		0.1	0.5	0.1	0.2	0.3	0.3	0.7	0.3	0.4	0.4	0.5	0.5		
	Q-length (m) (95%)		7.4	43.8	8.5	12.5	26.6	26.6	#36.8	20.8	36.2	23.2	25	25		
	Delay (s)		16.5	20.9	12.7	12.3	16.4	16.4	34.9	24.4	20.4	21.9	27.0	27.0		
	LOS		B	C	B	B	B	B	C	C	C	C	C	C		
	Approach Delay (s)			18.8			15.6			26.1			25.3			
	Approach LOS			B			B			C			C		22.1	C
6	Westwood & Ferry	Sig														
	Volume (vph)		42	247	81	66	197	226	55	300	90	112	179	21		
	V/C Ratio		0.2	0.4	0.4	0.4	0.3	0.2	0.2	0.7	0.7	0.3	0.2	0.2		
	Q-length (m) (95%)		11.5	25.5	25.5	16.9	18.4	9.5	11.4	63.8	63.8	12.5	20.3	20.3		
	Delay (s)		17.5	18.6	18.6	19.1	17.6	12.6	12.3	18.5	18.5	7.5	6.1	6.1		
	LOS		B	B	B	B	B	B	B	B	B	A	A	A		
	Approach Delay (s)			18.5			15.5			17.8			6.6			
	Approach LOS			B			B			B			A		15.1	B
7	Westwood & Range	Sig														
	Volume (vph)		73	58	41	1	59	89	40	140	1	40	84	16		
	V/C Ratio		0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.4	0.4	0.1	0.3	0.3		
	Q-length (m) (95%)		5.3	5.1	5.1	0.4	5.9	5.9	3.3	8.4	8.4	3.3	5.9	5.9		
	Delay (s)		3.5	3.4	3.4	3.2	3.5	3.5	8.4	9.3	9.3	8.4	8.8	8.8		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			3.5			3.5			9.1			8.7			
	Approach LOS			A			A			A			A		6.2	A
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			754	76	110	303		0		34					
	V/C Ratio			0.3	0.1	0.2	0.1				0.1					
	Q-length (m) (95%)			0.0	0.0	4.8	0.0				1.5					
	Delay (s)			0.0	0.0	10.6	0.0				10.7					
	LOS			A	A	B	A				B					
	Approach Delay (s)			0.0			2.8			10.7						
	Approach LOS			A			A			B					1.2	A

2008+15 AM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
10	Rec Place & Ferry	Sig														
	Volume (vph)		72	381	91	211	351	64	51	22	86	134	1	45		
	V/C Ratio		0.2	0.5	0.1	0.4	0.4	0.4	0.2	0.2	0.2	0.5	0.0	0.0		
	Q-length (m) (95%)		9.1	29.8	5.2	21.3	29.5	29.5	10.5	7.8	9.4	15.4	1.1	4.7		
	Delay (s)		10.9	15.4	9.2	19.5	12.9	12.9	17.7	24.0	16.2	23.7	24.4	20.1		
	LOS		B	B	B	B	B	B	B	C	C	C	C	C		
	Approach Delay (s)			13.8			15.2			17.8			22.8			
	Approach LOS			B			B			B			C		15.8	B
11	Wiebe & Range	Sig														
	Volume (vph)		9	64	29	26	113	7	21	20	6	19	7	28		
	V/C Ratio		0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.3	0.3	0.2	0.1	0.1		
	Q-length (m) (95%)		1	4	4	1.9	5.7	5.7	2	2.2	2.2	1.9	2.1	2.1		
	Delay (s)		1.7	1.8	1.8	1.7	1.8	1.8	13.0	13.4	13.4	13.1	12.5	12.5		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			1.8			1.8			13.2			12.7			
	Approach LOS			A			A			B			B		5.0	A
12	Westwood & Athlone	Sig														
	Volume (vph)					16		161		613	10	78	322			
	V/C Ratio					0.3		0.3		0.4	0.4	0.2	0.3			
	Q-length (m) (95%)					4.5		12.6		28	28	4.3	15.6			
	Delay (s)					19.2		12.0		6.2	6.2	1.7	1.6			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						12.6			6.2			1.6			
	Approach LOS						B			A			A		5.6	A
13	Anthem & Ferry	Unsig		1			3	6.0						7.0		
	Volume (vph)		0	625			382	53				0		32		
	V/C Ratio			0.2			0.1	0.1						0.0		
	Q-length (m) (95%)			0.0			0.0	0.0						0.9		
	Delay (s)			0.0			0.0	0.0						9.2		
	LOS			A			A	A						A		
	Approach Delay (s)			0.0			0.0						9.2			
	Approach LOS			A			A						A		0.3	A

2008+15 AM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
14	Westwood & Fairview	Unsig				1		1		2	2	3	4			
	Volume (vph)					10		21		603	3	3	335			
	V/C Ratio					0.1		0.1		0.4	0.4	0.0	0.2			
	Q-length (m) (95%)					1.2		1.2		0.0	0.0	0.1	0.0			
	Delay (s)					13.1		13.1		0.0	0.0	8.9	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						13.1			0.0			0.1			
	Approach LOS						B			A			A		0.4	A
15	Westwood & Laurel	Unsig				1		1		2	2	3	4			
	Volume (vph)					18		31		576	4	3	342			
	V/C Ratio					0.1		0.1		0.4	0.4	0.0	0.2			
	Q-length (m) (95%)					1.7		1.7		0.0	0.0	0.1	0.0			
	Delay (s)					12.9		12.9		0.0	0.0	8.9	0.0			
	LOS					B		B		A	A	A	A			
	Approach Delay (s)						12.9			0.0			0.1			
	Approach LOS						B			A			A		0.7	A
16	Ryan & Ferry	Sig														
	Volume (vph)		17	491	14	18	427	22	22	0	26	28	0	40		
	V/C Ratio		0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.0	0.0	0.2	0.0	0.0		
	Q-length (m) (95%)		11.9	11.9	11.9	10.5	10.5	10.5	3.2	0	0	3.7	0	0		
	Delay (s)		2.4	2.4	2.4	2.4	2.4	2.4	12.5	12.0	12.0	12.7	12.1	12.1		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			2.4			2.4			12.3			12.3			
	Approach LOS			A			A			B			B		3.4	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Table 5.12: 2023 PM Peak Hour Background + Site (Scenario IV)

2008+15 PM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		71	634	1147	183	841	165	605	718	60	146	1547	41		
	V/C Ratio		0.6	0.8	0.7	1.0	1.0	0.2	1.0	0.8	0.0	0.4	1.0	0.1		
	Q-length (m) (95%)		#28.2	123.6	0	#89.2	#178.0	21.6	#139.7	125.9	4.7	63.4	#216.5	14.3		
	Delay (s)		50.9	61.2	2.3	106.0	71.8	18.2	96.1	56.5	32.8	45.1	77.5	30.7		
	LOS		D	E	A	F	E	B	F	E	C	D	E	C		
	Approach Delay (s)			24.3			69.7			72.8			73.7			
	Approach LOS			C			E			E			E		57.9	E
2	Hwy 16 & Playhouse Access	Unsig														
	Volume (vph)		0		186				47	1423			2442	577		
	V/C Ratio				1.1				0.3	0.5			0.6	0.7		
	Q-length (m) (95%)				76.9				9.7	0.0			0.0	0.0		
	Delay (s)				154.4				37.4	0.0			0.0	0.0		
	LOS				F				E	A			A	A		
	Approach Delay (s)			154.4					1.2				0.0			
	Approach LOS			F					A				A		6.5	A
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		651	399	454	780	596	64	341	865	219	93	1646	691		
	V/C Ratio		1.1	0.8	1.1	1.0	1.0	0.2	0.8	0.7	0.2	0.5	1.1	0.4		
	Q-length (m) (95%)		#154.3	82.1	#158.5	#181.4	#142.4	23.8	#76.5	142.1	12.8	26.2	#238.7	0		
	Delay (s)		113.3	68.1	128.8	94.3	101.1	42.8	72.2	38.7	11.2	32.6	97.2	0.7		
	LOS		F	E	F	F	F	D	E	D	B	C	F	A		
	Approach Delay (s)			106.0			94.8			42.5			67.3			
	Approach LOS			F			F			D			E		76.5	E
4	Hwy 16 & Range	Unsig														
	Volume (vph)		0		181				68	1417			2521	216		
	V/C Ratio				1.4				0.5	0.5			0.8	0.1		
	Q-length (m) (95%)				95.8				17.1	0.0			0.0	0.0		
	Delay (s)				272.2				48.6	0.0			0.0	0.0		
	LOS				F				E	A			A	A		
	Approach Delay (s)			272.2					2.2				0.0			
	Approach LOS			F					A				A		11.9	B

2008+15 PM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		56	330	308	265	519	60	555	388	430	125	375	85		
	V/C Ratio		0.3	0.5	0.3	0.7	0.6	0.6	0.7	0.3	0.4	0.4	0.7	0.7		
	Q-length (m) (95%)		17	50.5	43.6	67.6	79.7	79.7	82.7	43.8	46.2	25.7	65.5	65.5		
	Delay (s)		30.8	37.3	20.0	27.0	32.1	32.1	39.2	23.2	15.3	28.9	39.0	39.0		
	LOS		C	D	C	C	C	C	D	C	B	C	D	D		
	Approach Delay (s)			29.1			30.5			27.2			36.9			
	Approach LOS			C			C			C			D		30.0	C
6	Westwood & Ferry	Sig														
	Volume (vph)		80	380	96	86	437	400	114	358	113	241	363	99		
	V/C Ratio		0.6	0.6	0.6	0.7	0.6	0.6	0.5	0.8	0.8	0.8	0.5	0.5		
	Q-length (m) (95%)		#21.9	39.8	39.8	#27.8	38.2	38.5	24	#93.7	#93.7	#43.2	49.3	49.3		
	Delay (s)		24.8	22.4	22.4	31.0	20.9	17.2	16.6	27.8	27.8	24.8	8.7	8.7		
	LOS		C	C	C	C	C	B	B	C	C	C	A	A		
	Approach Delay (s)			22.8			20.2			25.6			14.2			
	Approach LOS			C			C			C			B		20.3	C
7	Westwood & Range	Sig														
	Volume (vph)		21	117	109	3	228	184	60	148	6	127	277	38		
	V/C Ratio		0.1	0.3	0.3	0.0	0.6	0.6	0.2	0.3	0.3	0.3	0.5	0.5		
	Q-length (m) (95%)		3.7	13.1	13.1	1.1	32.1	32.1	7.8	14.4	14.4	13.6	27.7	27.7		
	Delay (s)		6.2	6.7	6.7	5.8	9.2	9.2	7.7	7.6	7.6	8.1	9.1	9.1		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			6.6			9.1			7.6			8.8			
	Approach LOS			A			A			A			A		8.3	A
8	Massey & Pine Centre Frontage	Unsig														
	Volume (vph)			872	123	443	612		0		205					
	V/C Ratio			0.3	0.1	0.8	0.2				0.4					
	Q-length (m) (95%)			0.0	0.0	58.3	0.0				16.9					
	Delay (s)			0.0	0.0	26.7	0.0				16.3					
	LOS			A	A	D	A				C					
	Approach Delay (s)			0.0			11.2			16.3						
	Approach LOS			A			B			C					6.7	A

2008+15 PM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
10	Rec Place & Ferry	Sig														
	Volume (vph)		141	409	264	724	556	192	260	52	336	360	13	140		
	V/C Ratio		0.5	0.6	0.2	1.0	0.7	0.7	0.6	0.3	0.6	0.9	0.3	0.2		
	Q-length (m) (95%)		18.4	48.3	11	#97.5	64.1	64.1	51.2	16.6	54.2	#55.6	6.6	13.8		
	Delay (s)		16.9	25.4	11.8	51.1	20.6	20.6	22.3	28.8	21.3	50.7	36.1	25.8		
	LOS		B	C	C	D	C	C	C	C	C	D	D	D		
	Approach Delay (s)			20.5			35.6				22.3		43.5			
	Approach LOS			C			D			C			D		30.5	C
11	Wiebe & Range	Sig														
	Volume (vph)		29	113	95	55	170	23	143	67	13	72	27	104		
	V/C Ratio		0.1	0.2	0.2	0.1	0.2	0.2	0.5	0.2	0.2	0.3	0.2	0.2		
	Q-length (m) (95%)		3.4	10.5	10.5	5.3	12.7	12.7	10.1	5.8	5.8	5.9	5.4	5.4		
	Delay (s)		3.5	3.8	3.8	3.6	3.8	3.8	9.8	8.7	8.7	9.0	8.5	8.5		
	LOS		A	A	A	A	A	A	A	A	A	A	A	A		
	Approach Delay (s)			3.8			3.8			9.4			8.7			
	Approach LOS			A			A			A			A		6.2	A
12	Westwood & Athlone	Sig														
	Volume (vph)					38		500		863	28	221	719			
	V/C Ratio					0.4		0.8		0.7	0.7	0.4	0.6			
	Q-length (m) (95%)					9.9		#84.1		55	55	15	53.2			
	Delay (s)					22.4		19.5		12.6	12.6	3.7	2.7			
	LOS					C		B		B	B	A	A			
	Approach Delay (s)						19.7			12.6			2.9			
	Approach LOS						B			B			A		10.4	B
13	Anthem & Ferry	Unsig														
	Volume (vph)		0	1503			802	87				0		65		
	V/C Ratio			0.5			0.2	0.1						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						2.4		
	Delay (s)			0.0			0.0	0.0						10.4		
	LOS			A			A	A						B		
	Approach Delay (s)			0.0			0.0					10.4				
	Approach LOS			A			A					B			0.3	A

2008+15 PM Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
14	Westwood & Fairview	Unsig														
	Volume (vph)					4		8		882	13	13	745			
	V/C Ratio					0.0		0.0		0.6	0.6	0.0	0.5			
	Q-length (m) (95%)					0.7		0.7		0.0	0.0	0.5	0.0			
	Delay (s)					17.5		17.5		0.0	0.0	10.2	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						17.5			0.0			0.2			
	Approach LOS						C			A			A		0.2	A
15	Westwood & Laurel	Unsig														
	Volume (vph)					8		13		882	16	12	738			
	V/C Ratio					0.1		0.1		0.6	0.6	0.0	0.5			
	Q-length (m) (95%)					1.1		1.1		0.0	0.0	0.5	0.0			
	Delay (s)					18.3		18.3		0.0	0.0	10.8	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						18.3			0.0			0.2			
	Approach LOS						C			A			A		0.3	A
16	Ryan & Ferry	Sig														
	Volume (vph)		61	692	48	63	814	80	53	0	65	58	0	84		
	V/C Ratio		0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.1	0.1	0.3	0.1	0.1		
	Q-length (m) (95%)		25.7	25.7	25.7	32.5	32.5	32.5	8.6	2.6	2.6	9.1	6.8	6.8		
	Delay (s)		3.4	3.4	3.4	3.7	3.7	3.7	14.4	13.4	13.4	14.6	13.5	13.5		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			3.4			3.7			13.9			13.9			
	Approach LOS			A			A			B			B		4.9	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

- At the intersection of Highway 16 and Ferry Avenue, the eastbound and westbound approaches have a LOS “F” and northbound and southbound approaches have a LOS “D” and “E” respectively. This intersection as a whole operates at LOS “E”. The eastbound left, eastbound right, westbound left, westbound through and the southbound through have v/c ratios of 1.0 or greater indicating that these movements are over capacity.
- At Westwood Drive and Massey Drive; southbound approach operates at LOS “D”
- At the intersection of Rec Place Drive and Ferry Avenue, the westbound and southbound approaches have LOS “D”, and the intersection as a whole operates at a LOS “C”. The westbound left turn movement have v/c ratios of 1.0, meaning that this movement is at capacity.
- At the unsignalized intersections of Highway 16 and Playhouse Access, and Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movements at LOS “F”.

During the Saturday midday hour, summarized in Table 5.13, all approaches and intersections are expected to operate at LOS “C” or better, with the exception of the following:

- At the intersection of Highway 16 and Highway 97, the westbound, northbound and southbound approaches experiencing LOS “E”. The intersection as a whole operates at LOS “D”. The westbound left, the northbound left and the southbound through movements all have a v/c ratio of 1.0 or greater, indicating that these movements are over capacity.
- At the intersection of Highway 16 and Ferry Avenue, the eastbound approach operates at LOS “F”, the eastbound, northbound and southbound approaches are at LOS “E”. The intersection as a whole operates at a LOS “E”. The eastbound left, the westbound through, the northbound left and the southbound through movements have v/c ratios of 1.0 or greater indicating that these movements are over capacity.
- At the intersection of Westwood Drive and Massey Drive, the intersection and the eastbound and westbound approaches operate at LOS “D”, and the southbound approach operates at LOS “E”.
- At the intersection of Westwood Drive and Ferry Avenue, the northbound approach experiences delays and queues resulting in LOS “D”. The northbound through and northbound right movements have v/c ratios of 0.9 indicating that each of these movements is near capacity.
- At the intersection of Rec Place Drive and Ferry Avenue the eastbound and southbound approaches at LOS “E”, the westbound and northbound approaches at LOS “D”, and the intersection as a whole operates at a LOS “D”. The westbound left turn movement has a v/c ratio of 1.0 indicating that this movement is at capacity.
- At the unsignalized intersection of Highway 16 and Playhouse Access, and Highway 16 and Range Road, a lack of gaps in the southbound traffic results in poor service for the outbound right turn movements resulting in LOS “F” and “E” respectively.

Table 5.14 summarizes the proposed road network improvements and the scenarios in which each improvement is required.

Table 5.13: 2023 Saturday Midday Peak Hour Background + Site (Scenario IV)

2008+15 Sat Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
1	Hwy 16 & Hwy 97	Sig														
	Volume (vph)		89	484	1445	140	500	131	781	906	34	91	1430	58		
	V/C Ratio		0.7	0.7	0.9	1.0	0.8	0.2	1.1	0.8	0.0	0.3	1.0	0.1		
	Q-length (m) (95%)		34.5	92.6	0	#69.5	96.5	22.9	#177.7	148.7	3.4	45	#206.1	17.6		
	Delay (s)		53.2	55.9	8.5	113.0	57.7	24.2	96.5	47.8	27.2	45.7	79.2	30.5		
	LOS		D	E	A	F	E	C	F	D	C	D	E	C		
	Approach Delay (s)			21.8			62.0			69.5			75.5			
	Approach LOS			C			E			E			E		54.3	D
2	Hwy 16 & Playhouse Access	Unsig			1				2	3			5	7		
	Volume (vph)		0		260				65	1889			2184	844		
	V/C Ratio				1.7				0.3	0.6			0.6	0.8		
	Q-length (m) (95%)				145.7				10.4	0.0			0.0	0.0		
	Delay (s)				363.1				30.0	0.0			0.0	0.0		
	LOS				F				D	A			A	A		
	Approach Delay (s)				363.1					1.0			0.0			
	Approach LOS				F					A			A		18.4	C
3	Hwy 16 & Ferry	Sig														
	Volume (vph)		753	335	366	329	484	43	578	1021	266	81	1280	830		
	V/C Ratio		1.1	0.7	0.8	0.4	1.0	0.1	1.1	0.8	0.2	0.7	1.1	0.5		
	Q-length (m) (95%)		#176.0	69.2	63.8	62.1	#115.4	18.1	#141.2	181	17.3	#32.0	#197.4	0		
	Delay (s)		111.1	65.4	52.7	43.7	86.1	45.7	115.3	45.2	10.5	50.3	112.9	1.1		
	LOS		F	E	D	D	F	D	F	D	B	D	F	A		
	Approach Delay (s)				85.9					62.0			68.2			
	Approach LOS				F					E			E		70.4	E
4	Hwy 16 & Range	Unsig			1				2	3			5	7		
	Volume (vph)		0		192				83	1590			1545	304		
	V/C Ratio				0.7				0.3	0.5			0.5	0.2		
	Q-length (m) (95%)				37.9				7.6	0.0			0.0	0.0		
	Delay (s)				41.2				18.4	0.0			0.0	0.0		
	LOS				E				C	A			A	A		
	Approach Delay (s)				41.2					0.9			0.0			
	Approach LOS				E					A			A		2.5	A

2008+15 Sat Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
5	Westwood & Massey	Sig														
	Volume (vph)		70	384	344	109	225	29	659	442	523	208	493	71		
	V/C Ratio		0.4	0.8	0.5	0.8	0.5	0.5	0.8	0.4	0.7	0.7	0.9	0.9		
	Q-length (m) (95%)		28.6	76.5	70.3	41.6	48.5	48.5	108.7	63.5	126	40.9	112.9	112.9		
	Delay (s)		42.8	58.1	22.7	58.1	47.2	47.2	47.2	25.8	27.2	39.4	66.8	66.8		
	LOS		D	E	C	E	D	D	D	C	C	D	E	E		
	Approach Delay (s)			41.5			50.4			34.9			59.4			
	Approach LOS			D			D			C			E		43.3	D
6	Westwood & Ferry	Sig														
	Volume (vph)		77	436	11	74	499	554	20	447	160	331	343	62		
	V/C Ratio		0.5	0.6	0.6	0.4	0.6	0.6	0.1	0.9	0.9	0.8	0.3	0.3		
	Q-length (m) (95%)		#22.8	40.4	40.4	20.2	44.7	57.2	5.9	#134.6	#134.6	#67.3	38.2	38.2		
	Delay (s)		27.9	24.7	24.7	25.1	25.1	19.1	14.1	38.0	38.0	28.1	6.9	6.9		
	LOS		C	C	C	C	C	B	B	D	D	C	A	A		
	Approach Delay (s)			25.2			22.2			37.2			16.5			
	Approach LOS			C			C			D			B		24.4	C
7	Westwood & Range	Sig														
	Volume (vph)		31	178	79	3	248	424	95	227	3	174	190	9		
	V/C Ratio		0.1	0.2	0.2	0.0	0.6	0.6	0.3	0.5	0.5	0.6	0.4	0.4		
	Q-length (m) (95%)		5.1	19	19	1	#63.2	#63.2	13.2	25.9	25.9	23.7	22.5	22.5		
	Delay (s)		4.5	4.7	4.7	4.1	7.5	7.5	11.2	11.7	11.7	14.9	11.4	11.4		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			4.7			7.5			11.6			13.0			
	Approach LOS			A			A			B			B		9.0	A
8	Massey & Pine Centre Frontage	Unsig		1	3	4	6				8					
	Volume (vph)			960	183	575	434		0		308					
	V/C Ratio			0.3	0.1	0.9	0.1				0.5					
	Q-length (m) (95%)			0.0	0.0	78.8	0.0				22.3					
	Delay (s)			0.0	0.0	33.1	0.0				16.1					
	LOS			A	A	D	A				C					
	Approach Delay (s)			0.0			18.8			16.1						
	Approach LOS			A			C			C					9.8	A
10	Rec Place & Ferry	Sig														
	Volume (vph)		215	435	355	984	641	289	323	77	425	481	21	263		
	V/C Ratio		0.9	0.9	0.4	1.0	0.8	0.8	0.8	0.4	0.7	0.9	0.2	0.8		
	Q-length (m) (95%)		#66.0	81.2	28.7	153.6	133.1	133.1	99.6	35.1	99.7	86.2	12.9	67.9		
	Delay (s)		60.8	76.0	28.9	54.4	39.8	39.8	44.6	54.8	27.7	71.5	56.7	59.8		
	LOS		E	E	E	D	D	D	D	D	D	E	E	E		
	Approach Delay (s)			56.1			47.3			36.8			67.1			
	Approach LOS			E			D			D			E		50.7	D

2008+15 Sat Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
11	Wiebe & Range	Sig														
	Volume (vph)		42	140	192	28	259	34	311	96	31	91	35	133		
	V/C Ratio		0.1	0.4	0.4	0.1	0.4	0.4	0.7	0.2	0.2	0.2	0.2	0.2		
	Q-length (m) (95%)		6.1	18.7	18.7	4.4	25.9	25.9	#37.3	11.4	11.4	10.7	9.2	9.2		
	Delay (s)		7.2	8.1	8.1	7.0	8.3	8.3	11.8	6.6	6.6	6.8	6.6	6.6		
	LOS		A	A	A	A	A	A	B	A	A	A	A	A		
	Approach Delay (s)			8.0			8.2			10.4			6.7			
	Approach LOS			A			A			B			A		8.5	A
12	Westwood & Athlone	Sig														
	Volume (vph)					46		620		1051	36	299	692			
	V/C Ratio					0.4		0.9		0.8	0.8	0.5	0.5			
	Q-length (m) (95%)					14.6		#138.6		#94.5	#94.5	37.9	50.9			
	Delay (s)					28.9		33.5		20.6	20.6	8.6	2.4			
	LOS					C		C		C	C	A	A			
	Approach Delay (s)						33.2			20.6			4.3			
	Approach LOS						C			C			A		17.8	B
13	Anthem & Ferry	Unsig		1			3	6.0						7.0		
	Volume (vph)		0	1454			798	135				0		93		
	V/C Ratio			0.5			0.2	0.2						0.1		
	Q-length (m) (95%)			0.0			0.0	0.0						3.8		
	Delay (s)			0.0			0.0	0.0						10.9		
	LOS			A			A	A						B		
	Approach Delay (s)			0.0			0.0						10.9			
	Approach LOS			A			A						B		0.4	A
14	Westwood & Fairview	Unsig				1		1		2	2	3	4			
	Volume (vph)					6		13		1074	12	11	726			
	V/C Ratio					0.1		0.1		0.7	0.7	0.0	0.5			
	Q-length (m) (95%)					1.5		1.5		0.0	0.0	0.5	0.0			
	Delay (s)					21.2		21.2		0.0	0.0	11.2	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						21.2			0.0			0.2			
	Approach LOS						C			A			A		0.3	A
15	Westwood & Laurel	Unsig				1		1		2	2	3	4			
	Volume (vph)					12		21		1065	13	10	723			
	V/C Ratio					0.1		0.1		0.7	0.7	0.0	0.5			
	Q-length (m) (95%)					2.8		2.8		0.0	0.0	0.5	0.0			
	Delay (s)					24.0		24.0		0.0	0.0	12.4	0.0			
	LOS					C		C		A	A	B	A			
	Approach Delay (s)						24.0			0.0			0.2			
	Approach LOS						C			A			A		0.5	A

2008+15 Sat Peak Hour Background+Site+Westwood with Improvement																
ID	Description	Sig/Unsig	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Int Delay	Int LOS
16	Ryan & Ferry	Sig														
	Volume (vph)		75	845	62	82	1046	99	69	0	84	75	0	109		
	V/C Ratio		0.6	0.6	0.6	0.7	0.7	0.7	0.4	0.1	0.1	0.4	0.2	0.2		
	Q-length (m) (95%)		43	43	43	61.4	61.4	61.4	15.8	4	4	16.9	13	13		
	Delay (s)		4.5	4.5	4.5	5.8	5.8	5.8	18.9	16.7	16.7	19.1	17.3	17.3		
	LOS		A	A	A	A	A	A	B	B	B	B	B	B		
	Approach Delay (s)			4.5			5.8			17.7			18.0			
	Approach LOS			A			A			B			B		6.9	A

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.

~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.

Table 5.14: Summary of Required Improvements by Scenario

Improvement Type		Scenario I	Scenario II	Scenario III	Scenario IV
Signalization					
	Westwood & Range		√	√	√
	Wiebe & Range		√	√	√
	Ryan & Ferry			√	√
	Westwood & Athlone				√
Geometric Improvements					
	Three SBT lanes @ Hwy 16 & Ferry	√	√	√	√
	Three SBT lanes @ Hwy 16 & Hwy97				√
	Two NBT lanes @ Westwood & Athlone				√
	Free-flow EBR @ Hwy 16 & Hwy 97	√	√	√	√
	Free-flow SBR @ Hwy 16 & Ferry		√	√	√
	Dual NBL lanes @ Hwy 16 & Ferry		√	√	√
	Dual EBL lanes @ Rec Place & Ferry		√	√	
	Dual WBL lanes @ Rec Place & Ferry		√	√	√
	Dual SBL lanes @ Rec Place & Ferry		√	√	√
	Dual NBL lanes @ Westwood & Massey				√
	Exclusive EBR lane @ Ferry & Rec Place		√	√	√
	Exclusive NBL lane @ Ferry & Rec Place		√	√	√
	Exclusive NBR lane @ Ferry & Rec Place		√	√	√
	Exclusive SBR lane @ Ferry & Rec Place		√	√	√
	Two-way left turn lane on Westwood		√	√	√
Signal Timing					
<i>Phasing</i>					
Hwy 16 & Ferry	NBL @ Hwy 16 & Ferry		√	√	√
Rec Place & Ferry	EBL @ Rec Place & Ferry		√	√	
	WBL @ Rec Place & Ferry		√	√	√
	SBL @ Rec Place & Ferry		√	√	√
	WBR @ Rec Place & Ferry		√	√	√
	NBL @ Rec Place & Ferry		√	√	√
	EBR @ Rec Place & Ferry		√	√	√
Westwood & Athlone	SBL @ Westwood & Athlone				√
	WBR @ Westwood & Athlone				√
Westwood & Massey	NBL @ Westwood & Massey				√
<i>Optimization</i>					
Hwy 16 & Hwy 97	optimize Hwy 16 & Hwy 97	√	√	√	√
Hwy 16 & Ferry	optimize Hwy 16 & Ferry	√	√	√	√
Rec Place & Ferry	optimize Rec Place & Ferry	√	√	√	√
Westwood & Massey	optimize Westwood & Massey		√	√	√
Westwood & Ferry	optimize Westwood & Ferry		√	√	√

5.2.5 Network Scenario Comparison and Analysis

Table 5.15 shows the differences in the required improvements from Table 5.14 for Scenarios II, III and IV. Our modeling in Synchro Sim Traffic allows for the comparison of the road network lane kilometres in each scenario, which is how the additional length of road was determined in Table 5.15.

Table 5.15: Comparison of Additional Road Network Improvements

Road Network Change	Scenario II	Scenario III	Scenario IV
Intersection Signalizations	2	3	4
Additional length of road compared to Scenario II	0 m	200 m	1430 m

Costs

The costs associated with the road network changes required to accommodate the PGGCC redevelopment will be significant no matter which network connection scenario is chosen. The cost associated with each proposed network connections from the PGGCC lands varies considerably. We understand that the City of Prince George has developed an order of magnitude cost estimate of about \$4 million for the Highway 97 connection. The connection to Westwood Drive is considered to be less expensive by the City than the Highway 97 connection.

It is beyond the scope of our assignment to develop cost estimates for each recommended network change. However, some general comments regarding costs can be made when comparing the required network changes for Scenarios II through IV.

- The cost to signalize an intersection in an urban area likely ranges between \$175,000 and \$250,000 in 2008 dollars²
- The cost to add new roadways and turning lanes varies significantly. If there is sufficient space within the existing right-of-way and few utilities or other road features that require relocation then roadway costs are primarily the construction cost. However, if utilities require relocation or property acquisition is necessary, the construction costs for the roadway may only be a small portion of the overall costs. The cost associated with the new road noted in Table 5.15 is likely \$1,000/m or more (in 2008 dollars). Since the details regarding each road improvement are not known, an upper range for road construction costs is not provided.

Assuming each signal is \$250,000 each and each metre of additional road construction, from Table 5.15, is \$1,000/m then the estimated minimum costs for additional network improvements in Scenario III is about \$450,000 and for the additional improvements in Scenario IV is about \$2 million. The actual project costs could be much higher.

² BC MoT, *Construction and Rehabilitation Cost Guide*, June 2007

Traffic

Our traffic analysis has determined the expected traffic volumes throughout the study area. In general, Scenarios II and III allowed the internal road, Rec Place Drive, to carry more traffic towards the east and Highway 97 than in Scenario IV. In Scenario IV, the traffic volumes are higher on Ferry Avenue and the west leg of the intersection of Westwood and Massey when compared with the other two scenarios.

Other Measures of Effectiveness

As noted earlier in this discussion, each Scenario provides a similar level of service throughout the study area. However, with the different traffic distribution patterns associated with each scenario and with the different levels of network changes required for each scenario, the level of service provided by each scenario is not the same. The Synchro Sim Traffic software is able to provide other measures of effectiveness as shown in Table 5.16.

A comparison of each of the measures of effectiveness in Table 5.16 indicates that no scenario provides a significantly better level of service than another does. For example, Scenario IV, with the network improvements provides slightly less control delay per vehicle during the afternoon peak and Saturday peak than the other scenarios. It also has the shortest total travel time through the network during these two periods. There are no differences in travel time and delays during the morning peak for Scenario II and Scenario III, but the travel times and delays in the morning peak are longer in Scenario IV.

Table 5.16: Network Measures of Effectiveness

Measures	Scenarios	Background (Scenario I)				Background +Site+2C (Scenario II)				Background +Site+H97 (Scenario III)				Background +Site+WW (Scenario IV)			
		AM	PM	Sat	Sum	AM	PM	Sat	Sum	AM	PM	Sat	Sum	AM	PM	Sat	Sum
Number of Intersections	without Improvement	11	11	11		17	17	17		17	17	17		15	15	15	
Control Delay / Veh (s/v)		22	36	43		19	75	203		19	74	131		20	86	327	
Queue Delay / Veh (s/v)		0	0	0		0	0	0		0	0	0		0	0	0	
Total Delay / Veh (s/v)		22	36	43		19	75	203		19	74	131		20	86	327	
Total Delay (hr)		122	295	351	768	146	963	2779	3888	146	965	1804	2915	152	1103	4488	5743
Stops / Veh		0.45	0.53	0.52		0.4	0.49	0.52		0.4	0.48	0.5		0.41	0.51	0.58	
Stops (#)		9065	15661	15308	40034	11128	22537	25407	59072	11131	22395	24996	58522	11253	23723	28461	63437
Average Speed (km/hr)		29	22	20		29	12	5		29	12	7		28	11	3	
Total Travel Time (hr)		260	499	554	1313	306	1231	3061	4598	307	1235	2087	3629	313	1379	4781	6473
Distance Traveled (km)		7619	11152	11152	29923	8791	14620	15294	38705	8833	14691	15373	38897	8879	15066	15863	39808
Fuel Consumed (l)		1272	2243	2389	5904	1498	4583	9739	15820	1502	4593	7036	13131	1526	5039	14596	21161
Fuel Economy (km/l)		6	5	4.7		5.9	3.2	1.6		5.9	3.2	2.2		5.8	3	1.1	
CO Emissions (kg)		23.66	41.73	44.44	109.83	27.87	85.25	181.15	294.27	27.94	85.44	130.87	244.25	28.38	93.73	271.49	393.6
NOx Emissions (kg)		4.57	8.05	8.58	21.2	5.38	16.45	34.96	56.79	5.39	16.49	25.26	47.14	5.48	18.09	52.4	75.97
VOC Emissions (kg)		5.46	9.62	10.25	25.33	6.43	19.66	41.78	67.87	6.44	19.71	30.18	56.33	6.55	21.62	62.62	90.79
Unserved Vehicles (#)		198	660	1073	1931	246	2672	3847	6765	245	2720	3998	6963	270	2908	4351	7529
Vehicles in dilemma zone (#)		193	189	203	585	203	201	217	621	201	201	217	619	203	201	217	621
Performance Index	147.2	338.7	393.1	879	177	1025.4	2849.7	4052.1	177	1027.4	1873.1	3077.5	183.2	1168.6	4567.2	5919	
Number of Intersections	with Improvement	11	11	11		17	17	17		17	17	17		15	15	15	
Control Delay / Veh (s/v)		19	25	27		17	30	30		17	30	30		18	27	29	
Queue Delay / Veh (s/v)		0	0	0		0	0	0		0	0	0		0	0	0	
Total Delay / Veh (s/v)		19	25	27		17	30	30		17	30	30		18	27	29	
Total Delay (hr)		106	204	221	531	130	389	411	930	130	383	418	931	134	354	401	889
Stops / Veh		0.45	0.52	0.51		0.39	0.46	0.48		0.39	0.46	0.47		0.41	0.51	0.55	
Stops (#)		9095	15368	15058	39521	10844	21311	23696	55851	10906	21386	23528	55820	11135	23623	27133	61891
Average Speed (km/hr)		31	27	26		30	22	22		30	23	22		30	24	23	
Total Travel Time (hr)		243	408	424	1075	290	657	693	1640	290	653	701	1644	295	630	694	1619
Distance Traveled (km)		7619	11152	11152	29923	8791	14620	15294	38705	8833	14691	15373	38897	8878	15066	15864	39808
Fuel Consumed (l)		1228	1981	2020	5229	1447	2959	3132	7538	1452	2951	3154	7557	1473	2957	3237	7667
Fuel Economy (km/l)		6.2	5.6	5.5		6.1	4.9	4.9		6.1	5	4.9		6	5.1	4.9	
CO Emissions (kg)		22.84	36.84	37.57	97.25	26.91	55.04	58.26	140.21	27	54.88	58.66	140.54	27.39	54.99	60.22	142.6
NOx Emissions (kg)		4.41	7.11	7.25	18.77	5.19	10.62	11.24	27.05	5.21	10.59	11.32	27.12	5.29	10.61	11.62	27.52
VOC Emissions (kg)		5.27	8.5	8.67	22.44	6.21	12.7	13.44	32.35	6.23	12.66	13.53	32.42	6.32	12.68	13.89	32.89
Unserved Vehicles (#)		74	13	86	173	106	664	533	1303	106	637	495	1238	124	288	290	702
Vehicles in dilemma zone (#)		179	195	184	558	196	199	185	580	194	204	182	580	197	205	186	588
Performance Index	131.1	247	262.6	640.7	160.1	448.4	477.1	1085.6	160.2	442.7	483.3	1086.2	165	419.3	476.8	1061.1	

6. Alternative Modes and Site Review

The study area is well serviced for a variety of alternate mode types including pedestrians, bicyclists and transit users. This section provides a description of the existing alternative mode system in the vicinity of the project site.

6.1 Transit Service

Bus service in the City of Prince George is provided by PG Transit for conventional transit services and Carefree Society for custom, HandyDART service. Currently, the following transit routes service the area.

- Route 46 Queensway Loop – transit service is provided southbound on Highway 16, westbound on Range Road, southbound on Wiebe Road and northbound on Westwood Drive between Range Road and Ferry Avenue. Service is provided hourly on weekdays between 7:00 am and 9:00 pm and on weekends between 8:00 am and 10:00 pm.
- Route 55 5th Victoria counter clockwise – transit service is provided eastbound on Ferry Avenue. Service is provided hourly during the weekday between 7:00 am and 9:30 pm and on the weekend between 7:00 am to 10:30 pm. Additional afternoon weekday service is provided on the half hour for school trips until mid June, between 3:30 pm and 6:30 pm.
- Route 88 Hart/Westgate – transit service is provided westbound on Massey Drive and southbound on Westwood Drive. Service is provided on the half hour on weekdays until 7:30 pm and hourly thereafter and on weekends.
- Route 89 Westgate/Hart – transit service is provided eastbound on Massey Drive and northbound on Westwood Drive. Service is provided on the half hour on weekdays until 7:30 pm and hourly thereafter and on weekends.

The existing Pine Centre Exchange, located within the boundaries of the Pine Center Mall operates as a transit exchange with provision for stops for Routes 5 (Spruceland), 46 (Downtown), 55 (Uplands), 88 (Hart to Westgate) and 89 (Westgate to Hart). The area is also well serviced by transit stops (as illustrated in Figure 6.1), some of which are wheelchair accessible. Specifically, ten stops are located along Westwood Drive with five wheel-chair accessible ones, two stops are on Ferry Avenue both of which are wheelchair accessible and one non-wheelchair accessible stop is located on Massey Drive.

With the proposed Mall expansion, opportunity exists to relocate the transit exchange to the PGGCC lands, increasing accessibility to the proposed higher density residential areas, as well as the recreational facilities contained within the site. As the detailed site planning process proceeds, it would be prudent to examine the potential for internal transit facilities such as routes within the site, as well as transit stops, which would make the area more accessible and sustainable.

Figure 6.1 – Bus Stop Locations



6.2 Bicycle Facilities

Within the study area, there exist several commuter and recreational bicycle facilities (Figure 6.2). On-street cycling routes where bicycles are required to share the traveled way with vehicles are located on Westwood Drive, Ferry Avenue and Massey Drive. The Official Community Plan (OCP) indicates a multi-use paved cycling path traversing the eastern edge of the PGGCC lands from Ferry Avenue towards Carrie Jane Gray Park, parallel to Highway 16 is proposed. However, as this is within the current Anthem Commercial Development site, it is not considered as part of this study.

With the proposed site development, consideration should be given to providing bicycling facilities that connect to the on-street network in a safe and efficient manner. Wherever possible, on-street bicycle facilities, such as bicycle lanes, should be terminated at an off-street destination or transitioned to an off street bicycle facility. In addition, priority should be given to the construction of bicycle facilities that facilitate connections to existing bicycle facilities.

6.3 Pedestrian

The PGGCC area is accessible to alternative mode pathways via a series of well developed multi-use paths, sidewalks and off-street paths and is illustrated in Figure 6.3. Specifically, pedestrian facilities are described below.

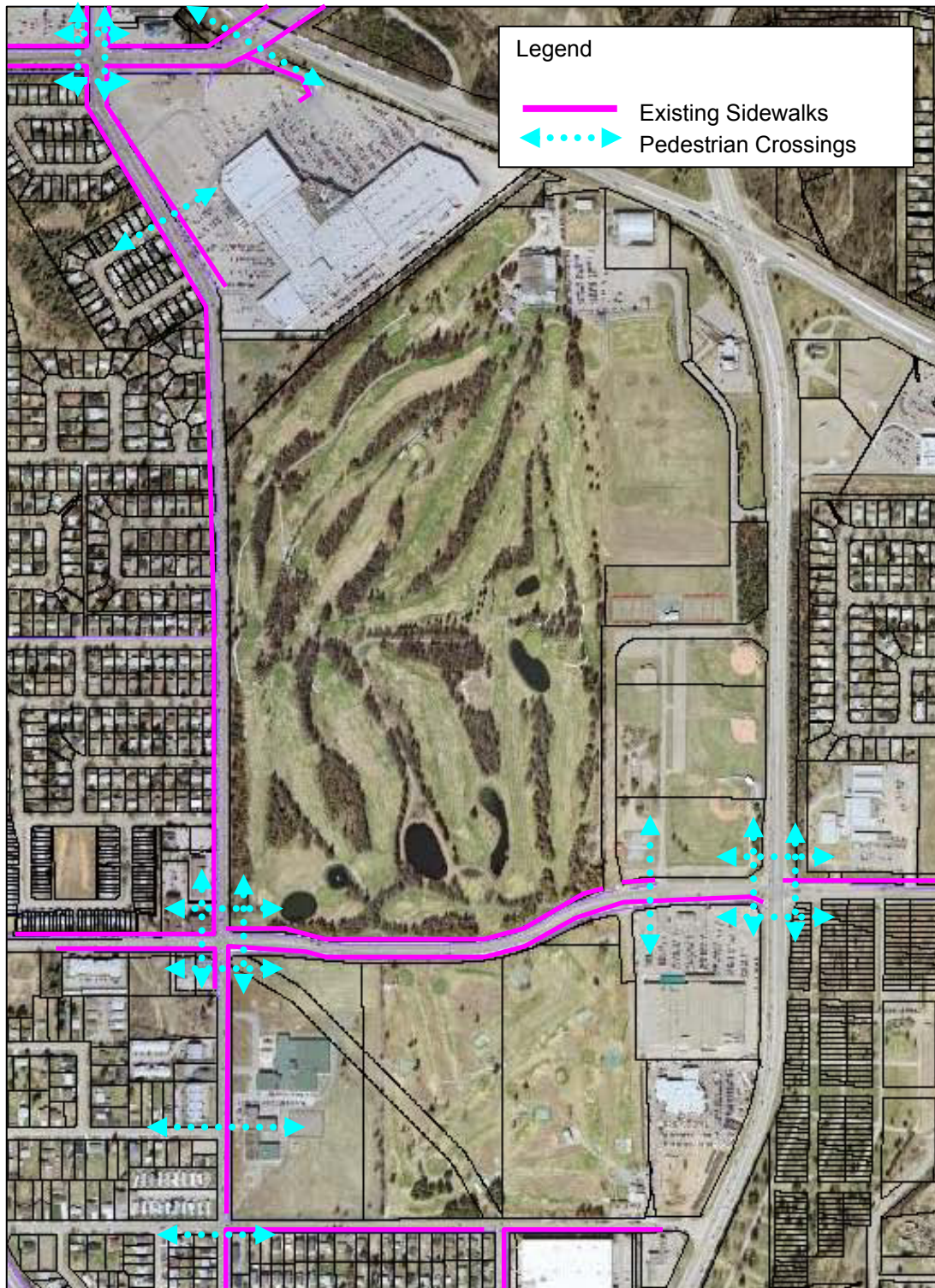
- The study area has sidewalks on the following streets:
 - Massey Drive on both sides of the street
 - Westwood Drive on the west side of the street between Massey Drive and Ferry Avenue, and on the east side of the street between Massey Drive and Lorne Crescent, and between Ferry Avenue and Range Road
 - Ferry Avenue on the north side of the street between Westwood Drive and Rec Place Drive, and south side of the street between Westwood Drive and Highway 16
 - Range Road on the south side of the street only between Westwood Drive and Highway 16
 - Wiebe Road on the east side of the street south of Range Road.
- Throughout the study area there are two types of marked crosswalks; marked crosswalks at intersections are provided at all signalized intersections and mid-blocks crosswalks. The mid-block pedestrian crossings are located on Westwood Drive at Lorne Crescent extending into the Pine Centre Mall and just north of Andres Road connecting the Peden Hill Elementary and John McInnis Junior Secondary Schools to the neighbourhood. A mid-block crossing is also located on Massey Drive at the Pine Centre Frontage connecting Prince George Secondary School with the Pine Centre Mall.

In support of the City's desire to encourage and support walking as an essential and healthy transportation mode, the detailed site planning process should accommodate quality pedestrian facilities, which provide for safe and well connected walking opportunities. This may include a hierarchy of pedestrian facilities including sidewalks, walkways and trails connecting to existing external pedestrian trail connections as illustrated in the concept plan (Figure 2.1), as well as a cohesive internal pedestrian network plan. Consideration should be given to connecting residential areas with public and commercial land uses such as the recreational facilities, and shopping areas. In addition, pedestrian paths should be located on pedestrian desire line where possible.

Figure 6.2 – OCP Bicycle Network



Figure 6.3 – Pedestrian Network



6.4 Site Access and On-site Circulation

As the number and location of access points to any development are integral to good design, the PGGCC Neighbourhood Concept Plan was evaluated to determine whether the proposed access points were adequate to meet the City's Zoning Bylaw No. 3482, 1980. These bylaws indicate that the number, location and width of all access and egress points, as they relate to off-street parking and by extension access to the development, are subject to the approval of the City Engineer. The Part III, Section 29.10 of the bylaw also notes that where more than 24 parking spaces are provided, at least two separate access points are required. To this end, the Concept Plan has been improved to meet City Standards. For the lands south of Ferry Avenue, the two proposed access points will be at Ferry Avenue and Rec Place Drive and at Wiebe Road and Range Road. For the lands north of Ferry Avenue, the access points will be at Highway 16 and the relocated Playhouse Access Road and at Ferry Avenue and Rec Place Drive.

If the internal connection to Athlone Avenue is not constructed as proposed in Scenario III, the northwest section of the site with only access proposed at Athlone Avenue will not meet City standards unless the extension to the Pine Centre Mall is built. From an internal network redundancy viewpoint, this option is less desirable than the internal road networks proposed in Scenarios II and IV. The current cul-de-sac of the internal "spine" road results in on-site traffic circulation and flow that is contained in two separate areas. This does not provide network redundancy in the event of congestion or traffic incidents on the adjacent street network. The connection of the "spine" road could provide for improved emergency access to the site from multiple points.

At the proposed accesses to the site from Ferry Avenue and Highway 16, provision has been made for left turn slots into the site. The proposed two-way left-turn lane on Westwood Drive can be modified to accommodate turn slots to the accesses at Athlone Avenue, Fairview Crescent, and Laurel Crescent. Consideration should also be given to providing the same type of turning lane on Range Road at Wiebe Road.

A preliminary assessment, based on site generated traffic, was conducted for the two proposed internal roundabouts on Rec Place Drive at Athlone Avenue and at Playhouse Access Road. Without the underpass connection to Highway 97 as proposed in Scenario IV, the traffic analysis suggests that single roundabouts with a single lane entrance and single lane exit for each approach provides an adequate level of service. With the underpass connection to Highway 97 as proposed in Scenarios II and III, the large number of northbound through and westbound right turning vehicles at Rec Place Drive and Playhouse Access Road suggests that an additional channelized westbound right turn lane with sufficient storage and a merge downstream is required at this roundabout. The resulting operations for the three peak hours are satisfactory at LOS "C" or better.

7. Findings & Recommendations

The proposed redevelopment of the current PGGCC and surrounding lands will change the landscape of the area, with the neighborhood plan concept resulting in a mix of land uses including residential, commercial, recreational, park and public space uses. Based on the traffic analysis contained in this report, the proposed ultimate development plan as outlined in the refined neighborhood concept will have significant impact on the operations of intersections in the study area.

With the full development in place, three scenarios with different internal road network connections were analyzed in Synchro Sim Traffic with the traffic generated by the PGGCC lands development. The requirements for network improvements for each scenario are summarized in Table 7.1. Based on our analysis, we have the following findings.

- Each of the three network scenarios requires a different number of changes to provide a similar, although not exactly the same level of service for Scenarios II through IV. An examination of Table 7.1 indicates that Scenario II, with the two network connections from the PGGCC lands requires the fewest network changes. Scenario IV, with the one network connection via Athlone to Westwood requires the most road network changes. The network improvements noted in Table 7.1 were considered to be the minimum required improvements. Additional network changes could be made if desired.
- The costs associated with the network connection to Highway 97 are expected to be very high, in Scenarios II and III but this cost would be offset, at least partially, by fewer required network improvements. The costs associated with the other network improvements could be very high as well, particularly the costs of the new lanes and turning lanes proposed. Additional work, beyond the scope of the study, is required to determine costs associated with the network improvements. The costs of the network improvements required for Scenario III would not be nearly as high as the costs for the improvements required for Scenario IV because only 200 m of road/lane is required in Scenario III as compared with 1430 m in Scenario IV.
- Traffic volumes using the proposed highway connection in Scenarios II and III are very large during the PM and Saturday peaks. Approximately 640 vehicles use the underpass in the PM peak and 630 vehicles use the underpass during the Saturday midday peak.
- Total distance traveled through the network is the shortest for Scenario II and longest for Scenario IV. The difference in the total distance traveled through the network between Scenario II and Scenario III is small.
- With the two network connections in Scenario II from the PGGCC lands, the network may provide alternative routes, which could be used by emergency vehicles if another route was blocked.
- The alternative modes review suggests that the site is well connected externally to the existing transit, pedestrian and cycling networks. Through the detailed site planning process and subsequent design phases, consideration should be given to the accommodation of quality pedestrian, cycling and transit facilities. Pedestrian and cycling facilities should provide for safe and well connected opportunities to existing pedestrian and cycling facilities as well as transit routing and bus stop locations.

Table 7.1: Summary of Required Improvements by Scenario

Improvement Type		Scenario I	Scenario II	Scenario III	Scenario IV
Signalization					
Westwood & Range			√	√	√
Wiebe & Range			√	√	√
Ryan & Ferry				√	√
Westwood & Athlone					√
Geometric Improvements					
Three SBT lanes @ Hwy 16 & Ferry		√	√	√	√
Three SBT lanes @ Hwy 16 & Hwy 97					√
Two NBT lanes @ Westwood & Athlone					√
Free-flow EBR @ Hwy 16 & Hwy 97	√		√	√	√
Free-flow SBR @ Hwy 16 & Ferry			√	√	√
Dual NBL lanes @ Hwy 16 & Ferry			√	√	√
Dual EBL lanes @ Rec Place & Ferry			√	√	
Dual WBL lanes @ Rec Place & Ferry			√	√	√
Dual SBL lanes @ Rec Place & Ferry			√	√	√
Dual NBL lanes @ Westwood & Massey					√
Exclusive EBR lane @ Ferry & Rec Place			√	√	√
Exclusive NBL lane @ Ferry & Rec Place			√	√	√
Exclusive NBR lane @ Ferry & Rec Place			√	√	√
Exclusive SBR lane @ Ferry & Rec Place			√	√	√
Two-way left turn lane on Westwood			√	√	√
Signal Timing					
Phasing					
Hwy 16 & Ferry	NBL @ Hwy 16 & Ferry		√	√	√
Rec Place & Ferry	EBL @ Rec Place & Ferry		√	√	
	WBL @ Rec Place & Ferry		√	√	√
	SBL @ Rec Place & Ferry		√	√	√
	WBR @ Rec Place & Ferry		√	√	√
	NBL @ Rec Place & Ferry		√	√	√
	EBR @ Rec Place & Ferry		√	√	√
Westwood & Athlone	SBL @ Westwood & Athlone				√
	WBR @ Westwood & Athlone				√
Westwood & Massey	NBL @ Westwood & Massey				√
Optimization					
Hwy 16 & Hwy 97	optimize Hwy 16 & Hwy 97	√	√	√	√
Hwy 16 & Ferry	optimize Hwy 16 & Ferry	√	√	√	√
Rec Place & Ferry	optimize Rec Place & Ferry	√	√	√	√
Westwood & Massey	optimize Westwood & Massey		√	√	√
Westwood & Ferry	optimize Westwood & Ferry		√	√	√

-
- The internal circulation for the current concept without the internal roadway connection to Athlone Avenue as proposed in Scenario III should be avoided so that the internal road network provides a continuous connection between Athlone Drive and Ferry Avenue. This will provide some network redundancy within the site, provide improved emergency access and relieve some of the pressure that would have been placed on the intersection of Rec Place Drive and Ferry Avenue without this connection. Access into the site should consider the provision for left turn slots into the site, at the Wiebe Road and Range Road. The current two-way left-turn lane can be modified to accommodate turn slots on Westwood Drive at the three site accesses. The two proposed internal roundabouts are recommended to be single lane roundabouts with one entrance and one exit lanes for each approach. Depending on the scenario, an additional channelized westbound right turn lane with sufficient storage and a merge downstream is required.

Based on our analysis of the traffic impacts of the proposed PGGCC Neighbourhood Concept Plan, we recommend that Scenario II with the two network connections from the development to the external road network be advanced. The benefits associated with the two network connections, as proposed in Scenario II, include better network connectivity, increased network redundancy and fewer other network improvements while providing a similar level of service as the other Scenarios. The requirement for fewer other network improvements may help to offset the costs associated with the underpass under Highway 97. In addition, the City may also wish to investigate the potential to stage the construction of the network improvements to help defer the costs associated with the network connections and the associated network improvements.

**Appendix I
Traffic Information**

2008 Traffic Counts

Vehicle Turning Movement Survey

TOTAL

N/S Street: Highway 16

Observer: Diane Allen & Paul Vandal

E/W Street: Highway 97

Notes:

LOCATION: N/E Corner

Speed Limit Major Street:	60
Speed Limit Minor Street:	60

DATE: Saturday March 15/2008 & Wednesday April 2/2008

WEATHER: Cool & Sun

TOTAL HOURS = 9

Wednesday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
6:00 - 6:15	6	13		30	21	17	3	34	5	1	77	27	234					
6:15 - 6:30	14	10		35	30	14	4	49	3	4	88	20	271		1			
6:30 - 6:45	13	8		54	50	10	5	51	9	1	149	26	376					
6:45 - 7:00	9	24		58	69	17	5	51	7	1	109	46	396	1277				
7:00 - 7:15	15	25	2	68	43	14	12	66	8	1	93	30	377	1420				
7:15 - 7:30	24	25		92	73	17	10	82	6	3	112	32	476	1625				1
7:30 - 7:45	39	29	7	163	11	21	14	102	13	2	217	73	691	1940				2
7:45 - 8:00	20	36	6	126	172	14	11	119	31	6	126	82	749	2293			2	
8:00 - 8:15	19	41	1	22	120	19	19	98	11	2	86	53	491	2407				2
8:15 - 8:30	14	49	4	157	126	16	19	143	21	6	121	85	761	2692	1			5
8:30 - 8:45	12	54	4	115	136	5	16	108	19	4	107	85	665	2666	2			
8:45 - 9:00	31	76	6	79	155	12	17	111	20	8	108	74	697	2614				
SUB TOTAL	216	390	30	999	1006	176	135	1014	153	39	1393	633	6184		4		2	10

Saturday	TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
11:00 - 11:15	20	83	7	121	62	11	35	85	9	20	115	108	676						
11:15 - 11:30	32	119	8	93	78	12	25	84	12	13	69	107	652						
11:30 - 11:45	28	93	7	16	81	146	36	92	12	115	85	7	718		1				
11:45 - 12:00	33	97	7	114	84	9	24	100	15	18	71	138	710	2756	1				
12:00 - 12:15	20	102	11	153	112	6	18	72	11	13	99	167	784	2864					
12:15 - 12:30	17	99	6	157	108	5	32	106	11	20	87	163	811	3023					
12:30 - 12:45	20	100	9	101	74		24	87	27	13	92	165	712	3017					
12:45 - 13:00	18	109	19	125	95	3	28	95	12	24	67	200	795	3102					
13:00 - 13:15	21	79	11	137	71	2	24	87	13	17	94	211	767	3085					
13:15 - 13:30	13	146	11	143	126	20	29	137	17	12	110	196	960	3234	2			2	
13:30 - 13:45	21	108	5	117	81	2	31	81	17	18	116	203	800	3322					
13:45 - 14:00	23	133	9	92	82	7	39	82	16	11	104	154	752	3279					
SUB TOTAL	266	1268	110	1369	1054	223	345	1108	172	294	1109	1819	9137		4			2	

Wednesday	TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
15:00 - 15:15	26	107	4	125	126	8	17	101	22	17	158	164	875				1	6	
15:15 - 15:30	21	124	7	66	78	8	20	158	19	15	111	174	801					2	
15:30 - 15:45	24	123	6	107	108	12	15	128	19	19	161	179	901		6			4	
15:45 - 16:00	27	113	9	62	46	5	24	168	19	7	90	87	657	3234					
16:00 - 16:15	24	152	5	109	84	8	22	157	16	20	144	152	893	3252	1				
16:15 - 16:30	33	155	3	114	90	14	21	151	24	15	130	148	898	3349				3	
16:30 - 16:45	41	151	7	102	69	6	25	143	21	21	121	166	873	3321	1			1	
16:45 - 17:00	19	209	9	101	84	13	41	197	24	12	136	190	1035	3699				4	
17:00 - 17:15	18	177	9	101	70	14	41	167	20	10	127	177	931	3737				4	
17:15 - 17:30	39	199	8	101	83	15	39	166	33	14	123	149	969	3808					
17:30 - 17:45	22	163	5	68	69	19	27	125	11	5	84	131	729	3664	2			5	
17:45 - 18:00	24	138	6	72	54	17	25	140	18	8	85	118	705	3334			1	7	
SUB TOTAL	318	1811	78	1128	961	139	317	1801	246	163	1470	1835	10267		10		2	36	

TOTAL	800	3469	218	3496	3021	538	797	3923	571	496	3972	4287	25588		18		4	48
AVGE VOL	89	385	24	388	336	60	89	436	63	55	441	476	2843		2		0	5

Vehicle Turning Movement Survey

TOTAL

N/S Street: HWY 16

Observer: Paul Vandal

E/W Street: Playhouse Access Rd

Notes:

LOCATION: _____

DATE: Saturday March 29/08 & Tuesday April 8/08

Speed Limit Major Street: 60 km/h

Speed Limit Minor Street: 50 km/h

WEATHER: sunny

TOTAL HOURS = 9

Tuesday TIME	North Approach			South Approach			East Approach			West Approach			Total Volume	Hourly Volume	Pedestrian			
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			N	S	E	W
6:00 - 6:15		33	14	7	43					1			98					
6:15 - 6:30		32			75								107					
6:30 - 6:45		45	2		155					1			203					
6:45 - 7:00		61	1		179					2		2	245	653				
7:00 - 7:15		60			173					6		6	245	800				
7:15 - 7:30		54			196								250	943				
7:30 - 7:45		71	2		306								379	1119				
7:45 - 8:00		124	17	3	355								499	1373				
8:00 - 8:15		105	7		264								376	1504	3			
8:15 - 8:30		115	5	3	358					1		1	483	1737				
8:30 - 8:45		107	2		267					1		1	378	1736				
8:45 - 9:00		175	1	1	340					2		2	521	1758				
SUB TOTAL		982	51	14	2711					14		12	3784		3			

Saturday

11:00 - 11:15		329	12	6	290					12		10	659				
11:15 - 11:30		249	10	9	199					9	1	8	485				
11:30 - 11:45		300	17	7	239					19		9	591				
11:45 - 12:00		264	18	8	282					4		11	587	2322	1		
12:00 - 12:15		256	5	5	224					6		3	499	2162			
12:15 - 12:30		320	9	3	252					6		6	596	2273	1		
12:30 - 12:45		270	6	2	247					5		5	535	2217		2	
12:45 - 13:00		329	13	5	277					7		12	643	2273			
13:00 - 13:15		367	15	4	256					7		6	655	2429			
13:15 - 13:30		303	3	3	225					9		13	556	2389			
13:30 - 13:45		293	7	7	221					9		6	543	2397	2		
13:45 - 14:00		322	17	8	219					3		7	576	2330		1	
SUB TOTAL		3602	132	67	2931					96	1	96	6925		4	3	

Tuesday

15:00 - 15:15		304	4	1	231					3		2	545				
15:15 - 15:30		361	4	1	222					1		2	591		3		
15:30 - 15:45		281	2		207								490		5		
15:45 - 16:00		291	7	1	182					4		1	486	2112			
16:00 - 16:15		376	6		225					1		1	609	2176			
16:15 - 16:30		323	3		193					5		1	525	2110			
16:30 - 16:45		393	3	5	216					10		1	628	2248			
16:45 - 17:00		414	4	3	170					2		2	595	2357			
17:00 - 17:15		446	5	1	209					3		3	667	2415			
17:15 - 17:30		368	11	1	179					1			560	2450			
17:30 - 17:45		335	13	3	144					2		6	503	2325			
17:45 - 18:00		312	15	9	201					3		2	542	2272			
SUB TOTAL		4204	77	25	2379					35		21	6741		8		

TOTAL		8788	260	106	8021					145	1	129	17450		15	3	
AVGE VOL		976	29	12	891					16	0	14	1939		2	0	

Vehicle Turning Movement Survey

TOTAL

N/S Street: HWY 16

Observer: Clarke Pollard & Diane Allen

E/W Street: Ferry Ave

Notes:

LOCATION: N-W corner

Speed Limit Major Street: 60 km/h

DATE: Saturday 3/15/2008 & Thursday 4/3/2008

Speed Limit Minor Street: 50 km/h

WEATHER: cool & snow

TOTAL HOURS = 9

Thursday TIME	North Approach			South Approach			East Approach			West Approach			Total Volume	Hourly Volume	Pedestrian			
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			N	S	E	W
6:00 - 6:15		26	1	13	75	25			10	3	4	1	158				1	
6:15 - 6:30	1	28	1	12	72	37	18	8	2	3	2	2	186					
6:30 - 6:45	3	47	1	7	146	57	11	17	3	7	10	4	313					
6:45 - 7:00	2	35	2	7	138	60	31	8	8	8	9	4	312	969			1	
7:00 - 7:15	7	38	5	8	155	48	40	12	9	3	13		338	1149				
7:15 - 7:30	7	81	13	5	137	67	25	1	9	4	16	6	371	1334			2	
7:30 - 7:45	6	43	8	9	263	111	28	28	17	15	32	3	563	1584				
7:45 - 8:00	15	62	7	12	294	168	57	31	12	16	45	17	736	2008				
8:00 - 8:15	12	91	13	27	330	136	62	36	12	6	56	7	788	2458				
8:15 - 8:30	6	84	9	33	337	148	110	42	22	13	49	8	861	2948				
8:30 - 8:45	16	104	8	32	274	100	88	56	17	23	45	19	782	3167				1
8:45 - 9:00	10	93	4	26	246	72	62	40	12	14	48	12	639	3070				1
SUB TOTAL	85	732	72	191	2467	1029	532	279	133	115	329	83	6047				4	3

Saturday

11:00 - 11:15	16	185	64	56	205	61	62	60	10	16	24	38	797					1
11:15 - 11:30	22	225	52	57	151	61	39	37	6	22	35	47	754		1			1
11:30 - 11:45	5	212	56	41	178	65	187	26	4	29	27	29	859					1
11:45 - 12:00	9	137	50	51	185	52	42	33	9	19	22	27	636	3046			3	
12:00 - 12:15	14	179	36	55	177	54	58	40	9	27	20	35	704	2953				
12:15 - 12:30	16	184	55	42	149	47	68	38	7	35	23	35	699	2898				1
12:30 - 12:45	21	208	60	41	180	56	54	36	4	26	34	40	760	2799		2		
12:45 - 13:00	16	250	60	50	226	55	66	43	7	31	48	44	896	3059				
13:00 - 13:15	6	217	43	41	155	48	76	41	7	38	38	4	714	3069				
13:15 - 13:30	4	193	49	63	211	63	68	48	11	26	43	46	825	3195			2	
13:30 - 13:45	13	211	51	54	187	47	53	44	9	28	42	24	763	3198				1
13:45 - 14:00	6	172	51	45	175	48	51	38	10	23	36	46	701	3003			1	
SUB TOTAL	148	2373	627	596	2179	657	824	484	93	320	392	415	9108		3	6		5

Thursday

15:00 - 15:15	17	150	35	82	236	106	92	79	18	28	38	31	912		2			1
15:15 - 15:30	15	258	54	32	161	72	86	42	12	26	48	35	841		6	11		8
15:30 - 15:45	21	232	39	37	174	94	119	80	13	30	62	39	940		1	5		
15:45 - 16:00	20	206	51	37	177	55	95	45	16	35	66	44	847	3540			2	1
16:00 - 16:15	18	182	49	28	126	66	112	56	18	27	60	29	771	3399	2	1		
16:15 - 16:30	19	253	51	26	132	52	130	64	19	24	51	40	861	3419	2	2		
16:30 - 16:45	8	263	54	11	142	25	150	91	14	34	58	50	900	3379			1	
16:45 - 17:00	16	284	50	17	153	46	153	99	14	42	73	55	1002	3534				
17:00 - 17:15	11	316	65	31	136	34	191	82	15	45	48	66	1040	3803				
17:15 - 17:30	14	299	44	20	254	49	168	89	15	26	63	53	1094	4036			5	
17:30 - 17:45	13	295	62	26	122	46	112	56	7	44	60	58	901	4037	3			
17:45 - 18:00	14	265	26	38	155	55	73	44	15	30	75	46	836	3871			2	1
SUB TOTAL	186	3003	580	385	1968	700	1481	827	176	391	702	546	10945		16	29		11

TOTAL	419	6108	1279	1172	6614	2386	2837	1590	402	826	1423	1044	26100		19	39		19
AVGE VOL	47	679	142	130	735	265	315	177	45	92	158	116	2900		2	4		2

Vehicle Turning Movement Survey

TOTAL

N/S Street: Hwy 16

Observer: Clark Pollard/Diane Allen

E/W Street: Range Rd

Notes:

LOCATION: _____

Speed Limit Major Street: 60 km/h

DATE: Saturday April 5/08 & Monday April 7/08

Speed Limit Minor Street: 50 km/h

WEATHER: cloudy

TOTAL HOURS = 9

Monday TIME	North Approach			South Approach			East Approach			West Approach			Total Volume	Hourly Volume	Pedestrian			
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			N	S	E	W
6:00 - 6:15		30		1	66							3	100					
6:15 - 6:30		25	3	2	79							1	110					
6:30 - 6:45		29	2	2	121							3	157					
6:45 - 7:00		48	2	1	217							3	271	638				
7:00 - 7:15		64	7	3	216							4	294	832				
7:15 - 7:30		87	4	3	206							4	304	1026				
7:30 - 7:45		73	13	11	292							6	395	1264		1		
7:45 - 8:00		77	6	13	435							8	539	1532				
8:00 - 8:15		146	10	26	447							9	638	1876				
8:15 - 8:30		139	7	10	379							6	541	2113				
8:30 - 8:45		160	8	24	410							15	617	2335				
8:45 - 9:00		179	14	6	444							9	652	2448				
SUB TOTAL		1057	76	102	3312							71	4618			1		

Saturday

11:00 - 11:15		289	70	20	324							24	727				
11:15 - 11:30		215	75	17	291							27	625				
11:30 - 11:45		230	74	12	294							21	631				
11:45 - 12:00		89	55	8	210							12	374	2357			
12:00 - 12:15		220	64	14	223							17	538	2168			
12:15 - 12:30		222	62	8	236							23	551	2094			
12:30 - 12:45		261	68	7	273							12	621	2084			
12:45 - 13:00		205	49	10	247							24	535	2245			
13:00 - 13:15		187	44	10	237							20	498	2205			
13:00 - 13:15		155	49	6	221							13	444	2098			
13:30 - 13:45		267	57	15	273							20	632	2109		2	
13:45 - 14:00		243	60	15	307							15	640	2214			
SUB TOTAL		2583	727	142	3136							228	6816			2	

Monday

15:00 - 15:15		267	57	15	273							20	632				
15:15 - 15:30		243	60	15	307							15	640				1
15:30 - 15:45		2583	727	142	3136							228	6816				
15:45 - 16:00														8088			2
16:00 - 16:15		294	30	12	234							12	582	8038			
16:15 - 16:30		323	50	8	267							21	669	8067			
16:30 - 16:45		357	39	16	270							16	698	1949			1
16:45 - 17:00		290	35	6	222							15	568	2517			
17:00 - 17:15		359	29	10	226							8	632	2567			
17:15 - 17:30		429	60	10	255							19	773	2671			1
17:30 - 17:45		409	29	5	223							16	682	2655			
17:45 - 18:00		327	44	7	224							29	631	2718			
SUB TOTAL		5881	1160	246	5637							399	13323				5

TOTAL		9521	1963	490	12085							698	24757		2	1	5
AVGE VOL		1058	218	54	1343							78	2751		0	0	1

Vehicle Turning Movement Survey

TOTAL

N/S Street: Westwood Dr

Observer: Clark Pollard & Diane Allen

E/W Street: Massey Dr

Notes:

LOCATION: _____

Speed Limit Major Street: 50 km/h
Speed Limit Minor Street: 50 km/h

DATE: Saturday March 29/08 & Tuesday April 1/08

WEATHER: cool/sunny

TOTAL HOURS = 9

Tuesday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
6:00 - 6:15	11	4	1	9	5	4		2		1	7	5	49			1		
6:15 - 6:30	6	5	1	5	7	4	2	6	1	1	10		48					
6:30 - 6:45	12	5	3	7	9	10	2	17		1	23		89			2		3
6:45 - 7:00	12	12	2	17	8	13	5	12	2	2	27	4	116	302	2	2		
7:00 - 7:15	7	10	4	16	10	9	6	15	4	6	19	1	107	360		2		2
7:15 - 7:30	10	7	7	28	14	18	3	34	4	5	42	6	178	490	1	2	1	
7:30 - 7:45	21	19	8	32	19	15	4	38	5	9	61	9	240	641	1	1	2	
7:45 - 8:00	24	19	15	34	11	37	4	39	2	12	83	8	288	813	1	1	1	
8:00 - 8:15	18	36	8	27	27	42	8	53	2	4	66	13	304	1010	1	4	3	2
8:15 - 8:30	25	23	7	37	19	59	13	45	4	4	115	18	369	1201	2	1		1
8:30 - 8:45	26	41	18	32	27	48	16	51		7	106	11	383	1344	4	5	2	2
8:45 - 9:00	29	24	17	32	25	28	15	65	3	12	84	19	353	1409				
SUB TOTAL	201	205	91	276	181	287	78	377	27	64	643	94	2524		12	21	9	10

Saturday	TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
11:00 - 11:15	65	107	16	98	67	48	22	43	3	26	111	9	615		4	3			
11:15 - 11:30	31	67	14	60	41	37	11	40	6	6	64	13	390		1	2			
11:30 - 11:45	31	56	15	51	26	35	16	43	5	9	64	20	371		6	1		3	
11:45 - 12:00	39	52	12	65	45	29	27	54	9	15	68	13	428	1804	3	5		2	
12:00 - 12:15	31	50	8	34	52	32	27	36	5	12	64	26	377	1566	2	3			
12:15 - 12:30	36	57	15	66	33	35	21	46	7	17	54	20	407	1583	8	3	3	1	
12:30 - 12:45	32	36	12	55	50	37	23	55	13	15	63	10	401	1613	10	2			
12:45 - 13:00	37	62	3	68	74	32	19	48	13	13	72	16	457	1642	4	4	2	1	
13:00 - 13:15	29	39	12	41	44	28	24	39	8	8	66	17	355	1620	7	4	2	1	
13:15 - 13:30	35	50	11	68	51	37	31	51	3	10	65	20	432	1645	10	5	5		
13:30 - 13:45	43	63	11	80	53	50	29	57	4	34	98	21	543	1787	2	3		1	
13:45 - 14:00	35	45	9	59	61	31	20	59	2	7	61	9	398	1728	6	6		1	
SUB TOTAL	444	684	138	745	597	431	270	571	78	172	850	194	5174		63	41	12	10	

Tuesday	TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
15:00 - 15:15	25	45	6	45	41	37	34	70	5	6	66	28	408		2	1	1	1	
15:15 - 15:30	31	51	12	48	65	32	42	98	3	8	61	50	501		5	3	2		
15:30 - 15:45	30	55	15	55	39	32	51	75	5	13	86	20	476		3	6	1	1	
15:45 - 16:00	34	54	10	62	44	40	39	82	12	5	68	19	469	1854	2	1	1	3	
16:00 - 16:15	21	58	9	55	42	29	41	75	10	11	57	13	421	1867	1	5	3		
16:15 - 16:30	28	45	16	61	44	35	29	100	5	12	86	21	482	1848	1	1	4	3	
16:30 - 16:45	33	57	13	79	44	31	54	92	5	9	54	20	491	1863		9	4		
16:45 - 17:00	25	41	18	47	39	40	48	108	14	9	70	22	481	1875			1	2	
17:00 - 17:15	22	49	18	59	42	36	62	101	10	14	80	17	510	1964	2	2	2		
17:15 - 17:30	20	68	19	60	48	22	39	114	19	13	60	22	504	1986	4	2	4	4	
17:30 - 17:45	18	46	17	42	33	26	35	78	9	13	53	21	391	1886		4	4		
17:45 - 18:00	22	36	17	45	38	21	32	69	7	19	44	10	360	1765	4	8	7	1	
SUB TOTAL	309	605	170	658	519	381	506	1062	104	132	785	263	5494		24	42	34	15	

TOTAL	954	1494	399	1679	1297	1099	854	2010	209	368	2278	551	13192		99	104	55	35
AVGE VOL	106	166	44	187	144	122	95	223	23	41	253	61	1466		11	12	6	4

Vehicle Turning Movement Survey

TOTAL

N/S Street: Westwood Dr

Observer: Terry Pollard

E/W Street: Ferry Ave

Notes:

LOCATION: _____

Speed Limit Major Street: 50 km/h
Speed Limit Minor Street: 50 km/h

DATE: Saturday March 29/08 & Thursday April 3/08

WEATHER: cool/clear/sunny

TOTAL HOURS = 9

Thursday TIME	North Approach			South Approach			East Approach			West Approach			Total Volume	Hourly Volume	Pedestrian			
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			N	S	E	W
6:00 - 6:15	3	14	1	1	12	3		4	8	3	8	1	58					
6:15 - 6:30	4	3			7	2		3	3	1	7	1	31					
6:30 - 6:45	8	7	1		12	4		4	9	2	16		63		1		1	
6:45 - 7:00	5	12	2		18	2		5	5		17	1	67	219		1	1	
7:00 - 7:15	4	12	1		16	2	4	13	16		12		80	241				
7:15 - 7:30	7	13	1	3	25	11	3	7	7	5	24		106	316		2	2	
7:30 - 7:45	15	12		1	25	6	4	9	17	4	41	4	138	391	2		1	
7:45 - 8:00	18	26	2		50	10	4	13	25	13	58	8	227	551	1	4	1	
8:00 - 8:15	21	26	1	5	41	13	13	23	37	7	24	23	234	705		3	5	
8:15 - 8:30	15	38	1	15	75	29	19	21	35	4	27	25	304	903	4	8	4	
8:30 - 8:45	18	31	2	24	67	20	17	27	36	4	34	9	289	1054	10	1	10	
8:45 - 9:00	20	13	5	1	37	4		15	20	5	17	3	140	967			2	
SUB TOTAL	138	207	17	50	385	106	64	144	218	48	285	75	1737		17	20	22	35

Saturday

11:00 - 11:15	40	59	6	1	82	49	13	35	94	9	36	4	428		3	3	1	
11:15 - 11:30	31	32	28	1	73	20	10	25	48	5	35	1	309					
11:30 - 11:45	41	61	7	3	70	35	10	23	58	8	31	4	351		2	1		
11:45 - 12:00	39	59	3	4	81	24	6	37	42	11	45		351	1439	1		2	2
12:00 - 12:15	35	41	8	3	58	28	7	26	59	8	32	2	307	1318	1		2	2
12:15 - 12:30	47	62	20	5	71	31	8	22	51	16	31	6	370	1379		1		
12:30 - 12:45	55	59	8	3	79	31	11	37	73	14	39		409	1437		3		1
12:45 - 13:00	54	63	8	6	86	25	19	39	66	6	19	3	394	1480	1			1
13:00 - 13:15	39	66	8	1	76	39	14	35	75	11	38	2	404	1577	3	2	5	2
13:15 - 13:30	46	50	4	6	90	33	15	36	62	10	36	4	392	1599	2		1	
13:30 - 13:45	36	49	5	3	64	34	13	24	57	7	20	2	314	1504	4			
13:45 - 14:00	57	62	6	7	74	26	6	24	50	5	42	1	360	1470			2	2
SUB TOTAL	520	663	111	43	904	375	132	363	735	110	404	29	4389		15	11	14	10

Thursday

15:00 - 15:15	8	58	36	45	50	3	12	34	19	19	27	52	363		5	4	7	8
15:15 - 15:30	48	82	11	22	84	35	22	37	61	16	44	14	476		20	16	22	22
15:30 - 15:45	36	60	6	13	76	30	18	41	41	5	26	5	357		3	7	4	4
15:45 - 16:00	48	62	9	11	54	22	17	48	66	7	52	6	402	1598		3	5	10
16:00 - 16:15	40	44	7	3	55	22	12	33	40	8	36	6	306	1541	2	2		5
16:15 - 16:30	49	86	7	5	59	20	16	43	43	4	45	6	383	1448	7	4	5	3
16:30 - 16:45	34	48	7	5	54	25	9	35	49	8	27	7	308	1399			5	
16:45 - 17:00	42	66	6	7	49	23	11	50	47	15	41	3	360	1357			4	5
17:00 - 17:15	43	60	10	6	45	23	13	38	42	7	42	3	332	1383	1	4		2
17:15 - 17:30	58	105	10	8	67	42	25	52	66	15	47	4	499	1499		5	7	5
17:30 - 17:45	36	50	10	5	42	14	14	30	48	3	18	2	272	1463		5		2
17:45 - 18:00	50	68	13	6	51	24	11	43	37	11	46	5	365	1468		5	2	2
SUB TOTAL	492	789	132	136	686	283	180	484	559	118	451	113	4423		38	55	61	68

TOTAL	1150	1659	260	229	1975	764	376	991	1512	276	1140	217	10549		70	86	97	113
AVGE VOL	128	184	29	25	219	85	42	110	168	31	127	24	1172		8	10	11	13

Vehicle Turning Movement Survey

TOTAL

N/S Street: Westwood Dr

Observer: Terry Pollard

E/W Street: Range Rd

Notes:

LOCATION: _____

Speed Limit Major Street: 50 km/h
Speed Limit Minor Street: 50 km/h

DATE: Saturday March 22/08 & Monday April 7/08

WEATHER: sunny/cool/windy

TOTAL HOURS = 9

Monday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
6:00 - 6:15	4	2			5	1		1	3		4		20					
6:15 - 6:30	1	3		2	3			1	3	1	2		16					
6:30 - 6:45		3			3				1	2			9					
6:45 - 7:00	7	6	2	5	20			3	10	4	7	7	71	116	2	2	2	1
7:00 - 7:15	4	6		5	5			2	8	6	3	3	42	138				
7:15 - 7:30	3	4		9	19			6	9	3	1	4	58	180			1	1
7:30 - 7:45	8	7	2	11	16	1			20	4	15	7	91	262	2	2	1	2
7:45 - 8:00	4	10	1	5	27		1	9	23	7	15	7	109	300	1		1	2
8:00 - 8:15	8	7	3	12	20			6	9	7	7	10	89	347	3		6	1
8:15 - 8:30	8	15	3	5	33	1		6	22	18	9	11	131	420	9		17	5
8:30 - 8:45	6	18	6	10	25			4	17	26	8	5	125	454	20		18	2
8:45 - 9:00	2	17	2	12	10	2		10	16	5	4	3	83	428	5		2	
SUB TOTAL	55	98	19	76	186	5	1	48	141	83	75	57	844		42	4	48	14

Saturday

11:00 - 11:15	28	24	4	12	34	1		21	56	6	39	19	244				2	1
11:15 - 11:30	32	28	3	7	32	1	1	28	64	6	30	9	241			1	6	
11:30 - 11:45	27	31	4	13	35		1	25	64	4	37	13	254				1	1
11:45 - 12:00	26	26	3	12	27		1	16	58	5	19	9	202	941		1		
12:00 - 12:15	28	34	5	16	38		2	31	71	7	28	18	278	975	1		2	
12:15 - 12:30	31	49	5	11	32	1		29	64	7	33	15	277	1011		3	2	
12:30 - 12:45	23	32	1	10	37	1	1	30	75	1	17	16	244	1001			1	1
12:45 - 13:00	30	27	7	15	28	1		21	81	3	22	12	247	1046		1	1	1
13:00 - 13:15	30	20	1	10	39	1		20	82	5	22	21	251	1019			9	
13:15 - 13:30	31	42	1	27	35		1	21	71	5	29	15	278	1020			6	
13:30 - 13:45	39	33	1	17	42			24	94	8	31	14	303	1079	2	1	8	
13:45 - 14:00	30	30	4	22	39	1	1	27	92	7	27	13	293	1125		1	5	
SUB TOTAL	355	376	39	172	418	7	8	293	872	64	334	174	3112		3	8	43	4

Monday

15:00 - 15:15	20	42	8	19	23	1	1	22	40	9	11	12	208		7		4	
15:15 - 15:30	22	36	7	15	25	1		16	52	9	14	19	216		18	1	14	4
15:30 - 15:45	21	43	8	14	27		1	24	46	5	16	16	221		4		9	2
15:45 - 16:00	15	45	9	18	28	1	1	20	50	8	15	12	222	867	2	2	1	
16:00 - 16:15	23	36	3	12	25	1		19	38	6	18	15	196	855	1	1		2
16:15 - 16:30	24	40	9	17	36		2	28	34	11	10	15	226	865	3	1	8	1
16:30 - 16:45	17	32	6	11	16			14	29	5	12	8	150	794		1	1	
16:45 - 17:00	44	46	6	17	36	2		32	45	5	21	33	287	859	1	1	8	2
17:00 - 17:15	20	38	7	10	22	1		19	32	3	13	20	185	848			5	
17:15 - 17:30	23	63	10	18	23	2	2	27	47	8	21	17	261	883	2	1	5	
17:30 - 17:45	7	54	7	3	15			21	23	1	15	17	163	896		1	6	
17:45 - 18:00	16	27	9	5	27		2	24	48	5	17	16	196	805	2	1	2	2
SUB TOTAL	252	502	89	159	303	9	9	266	484	75	183	200	2531		40	10	63	13

TOTAL	662	976	147	407	907	21	18	607	1497	222	592	431	6487		85	22	154	31
AVGE VOL	74	108	16	45	101	2	2	67	166	25	66	48	721		9	2	17	3

Vehicle Turning Movement Survey

TOTAL

N/S Street: Massey Dr

Observer: Terry Pollard & Paul Vandal

E/W Street: Pine Centre Frontage Rd

Notes:

LOCATION: _____

DATE: Saturday March 22/2008 & Tuesday April 1/2008

Speed Limit Major Street: 50

Speed Limit Minor Street: 50

WEATHER: cool/cloudy

TOTAL HOURS = 9

Tuesday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
6:00 - 6:15	6	6			22	11							45				2	
6:15 - 6:30	1	5			14	9							29				1	
6:30 - 6:45	4	21			32	13							70			1		1
6:45 - 7:00	13	15			46	5			1				80	224			2	
7:00 - 7:15	6	28			30	4			1				69	248		4	1	
7:15 - 7:30	8	33			59	11			1				112	331		4	3	
7:30 - 7:45	6	38			78	19			3				144	405	1		1	
7:45 - 8:00	13	40			123	13			1				190	515	1	2	1	1
8:00 - 8:15	8	57			116	12			7				200	646	1	9	3	
8:15 - 8:30	27	49			151	12			2				241	775		9	1	9
8:30 - 8:45	24	74			149	24			15				286	917		52		7
8:45 - 9:00	29	60			102	9			3				203	930	4	20	1	1
SUB TOTAL	145	426			922	142			34				1669		7	101	16	19

Saturday

11:00 - 11:15	152	96			150	34			59				491					
11:15 - 11:30	108	52			86	31			39				316					
11:30 - 11:45	86	62			100	27			50				325					
11:45 - 12:00	123	79			98	27			44				371	1503				
12:00 - 12:15	121	91			162	41			55				470	1482				
12:15 - 12:30	91	73			89	26			49				328	1494				
12:30 - 12:45	110	70			141	41			54				416	1585				
12:45 - 13:00	101	59			108	28			45				341	1555				
13:00 - 13:15	114	79			119	31			65				408	1493				
13:15 - 13:30	112	79			101	36			59				387	1552				
13:30 - 13:45	132	80			145	36			64				457	1593				
13:45 - 14:00	102	98			140	37			58				435	1687				
SUB TOTAL	1352	918			1439	395			641				4745					

Tuesday

15:00 - 15:15	125	120			160	19			50				474			25	3	34
15:15 - 15:30	92	160			107	25			38				422			108	3	105
15:30 - 15:45	69	98			96	21			39				323		2	21		14
15:45 - 16:00	68	103			125	28			37				361	1580		5	6	4
16:00 - 16:15	94	105			11	22			49				281	1387		1	2	1
16:15 - 16:30	71	110			103	20			36				340	1305		14	2	10
16:30 - 16:45	59	135			91	21			42				348	1330		17	2	10
16:45 - 17:00	62	138			94	17			31				342	1311		14		7
17:00 - 17:15	86	164			132	26			36				444	1474		2	4	4
17:15 - 17:30	75	154			104	23			32				388	1522	1	7	9	2
17:30 - 17:45	41	89			67	16			24				237	1411		4	1	3
17:45 - 18:00	29	56			66	16			20				187	1256	1	1	1	2
SUB TOTAL	871	1432			1156	254			434				4147		4	219	33	196

TOTAL	2368	2776			3517	791			1109				10561		11	320	49	215
AVGE VOL	263	308			391	88			123				1173		1	36	5	24

Vehicle Turning Movement Survey

TOTAL

N/S Street: N: Eastbound Off Ramp S: Eastbound On Ramp

Observer: Diane Allen & Terry Pollard

E/W Street: Pine Centre Frontage Rd

Notes:

LOCATION: SE corner

Speed Limit Major Street: 50

DATE: Saturday Mar 22/08 & Wednesday April 2/08

Speed Limit Minor Street: 50

WEATHER: cool/sunny/windy

TOTAL HOURS = 9

Wednesday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
6:00 - 6:15									2	12			14					
6:15 - 6:30		1		1	1	1			1	7			12		1			
6:30 - 6:45	1										17		18			1		
6:45 - 7:00	1							1		12	2		16	60		1		
7:00 - 7:15	1			1	1			1		7	2		13	59		1		
7:15 - 7:30	1	2	1			2		1	1	17	3		28	75				
7:30 - 7:45	1	2		1					1	17	1		23	80	1	1	1	
7:45 - 8:00		6	1	2					1	18	3		31	95				
8:00 - 8:15	2	2		1	2	2		2	3	19	2		35	117	3	1		
8:15 - 8:30	4	4	2	2				1		11	6		30	119		2		
8:30 - 8:45	1	3	1		2	1		1		16	1		26	122		1		
8:45 - 9:00	4	11	1		3			2	1	28	3		53	144		3		
SUB TOTAL	16	31	6	8	9	6		9	10	181	23		299		5	11	1	

Saturday	TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Total	Hourly	N	S	E	W
11:00 - 11:15	9	26	3	7	25	6		8	5	36	7	6	138					7	
11:15 - 11:30	5	21	5	8	17	6	3	4	4	31	5	1	110					4	
11:30 - 11:45	10	28	5	8	15	4	6	10	3	38	11		138		1			12	
11:45 - 12:00	9	23	6	7	26	10	5	6	4	47	11		154	540				8	
12:00 - 12:15	7	18	7	8	22	2	2	8	11	35	16	3	139	541				14	
12:15 - 12:30	1	23	1	7	22	5		7	9	58	14		147	578				5	
12:30 - 12:45	13	24	11	10	24	4	4	10	7	46	12	3	168	608				10	
12:45 - 13:00	7	33	6	5	24	9	7	9	11	70	14	2	197	651				39	
13:00 - 13:15	6	24	4	5	33	1	2	12	4	62	15	3	171	683				18	
13:15 - 13:30	15	29	3	9	27	2	7	15	5	67	21	3	203	739				32	
13:30 - 13:45	8	22	6	1	23	5	6	11	12	49	18		161	732				24	
13:45 - 14:00	13	30	8	6	28	6	3	8	14	54	16	1	187	722				33	
SUB TOTAL	103	301	65	81	286	60	45	108	89	593	160	22	1913		1		206		

Wednesday	TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Total	Hourly	N	S	E	W
15:00 - 15:15	5	17	6	3	19			14	10	28	19		121		1	2		2	
15:15 - 15:30	6	16	4	4	9	1	5	7	5	29	6	1	93						
15:30 - 15:45	4	15	9	4	13	3	3	9	5	55	8		128		1	13		2	
15:45 - 16:00	6	17	4	7	19	2		5	5	38	7		110	452		2		3	
16:00 - 16:15	1	9	3	7	9	1	1	9	1	39	6	3	89	420	3	1		7	
16:15 - 16:30	1	16	1		15	4	2	7	7	29	7		89	416		1		1	
16:30 - 16:45	4	17	5	2	19	2	1	8	4	38	7	2	109	397					
16:45 - 17:00	3	12		5	27	2	1	8	5	34	11	1	109	396		1		2	
17:00 - 17:15	2	10	3		14	2	1	9	1	31			73	380	1			1	
17:15 - 17:30	2	7	2	4	15	1	1	5	7	26	6		76	367				3	
17:30 - 17:45	4	15	5	8	14			3	5	35	5		94	352				2	
17:45 - 18:00	4	6	12	5	17		2	13	12	60	13		144	387				3	
SUB TOTAL	42	157	54	49	190	18	17	97	67	442	95	7	1235		6	20	26		

TOTAL	161	489	125	138	485	84	62	214	166	1216	278	29	3447		12	31	233	
AVGE VOL	18	54	14	15	54	9	7	24	18	135	31	3	383		1	3	26	

Vehicle Turning Movement Survey

TOTAL

N/S Street: Rec Place Dr

Observer: Diane Allen & Terry Pollard

E/W Street: Ferry Ave

Notes:

LOCATION: NE corner

Speed Limit Major Street: 50 km/h
Speed Limit Minor Street: 50 km/h

DATE: Saturday Mar 29/08 & Tuesday April 8/08

WEATHER: cool/sunny

TOTAL HOURS = 9

Tuesday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
6:00 - 6:15		1		1			4	4		3	8	4	25					
6:15 - 6:30							1	1	1	1	11		15					
6:30 - 6:45							1	20			3		24					
6:45 - 7:00	2						3	12		2	20		39	103	1			
7:00 - 7:15	1		2	1			6	13			15	5	43	121	1	1		
7:15 - 7:30			8	2		1	12	8		2	16	4	53	159				
7:30 - 7:45	2			4			19	14		1	26	5	71	206	1	1		
7:45 - 8:00	4		2	1			6	25	5	5	57	3	108	275				
8:00 - 8:15	3		1	3			13	28	2	10	65	8	133	365	1	1	1	1
8:15 - 8:30	13		7	12		1	22	59		9	75	23	221	533	1	3	1	
8:30 - 8:45	2	1	1	3			21	60		3	56	6	153	615				
8:45 - 9:00	7		2	5	1	1	21	72	1	8	62	19	199	706	3	1		
SUB TOTAL	34	2	23	32	1	3	129	316	9	44	414	77	1084		8	7	2	1

Saturday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
11:00 - 11:15	21	3	13	42	3	2	59	50	5	8	50	34	290					
11:15 - 11:30	15	3	70	33	4	6	77	65	5	17	34	44	373			2		
11:30 - 11:45	24	9	11	62	7	9	117	98	4	29	73	69	512			4		1
11:45 - 12:00	20	2	12	38	5	6	84	66	8	27	61	53	382	1557			1	1
12:00 - 12:15	22	4	9	21	6	3	80	49	7	15	34	35	285	1552			2	
12:15 - 12:30	12	1	6	26	5	4	60	59	4	18	33	29	257	1436	1	4		1
12:30 - 12:45	6	4	7	21	2	4	57	56	3	12	31	22	225	1149				
12:45 - 13:00	18	5	13	30	7	8	65	65	8	18	44	34	315	1082				
13:00 - 13:15	19	2	13	39	3	5	59	64	1	22	44	50	321	1118			2	
13:15 - 13:30	12	8	13	31	2	7	100	67	5	21	40	44	350	1211	1			
13:30 - 13:45	15	1	10	27	4	9	79	69	4	16	60	59	353	1339			2	3
13:45 - 14:00	20	7	10	42	11	4	75	80	11	19	43	85	407	1431				
SUB TOTAL	204	49	187	412	59	67	912	788	65	222	547	558	4070		2	17	1	5

Tuesday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
15:00 - 15:15	11	4	3	34		6	88	60		16	54	41	317		1			1
15:15 - 15:30	13	1	4	41		11	53	47	2	11	64	40	287		2	9	2	2
15:30 - 15:45	18	2	6	25	2	3	72	60	2	8	59	41	298		8	9	2	5
15:45 - 16:00	14	2	5	52	2	5	74	66	1	15	67	35	338	1240	1	3	1	
16:00 - 16:15	12	2	8	18	1	2	53	68	1	10	46	38	259	1182	1	2	1	3
16:15 - 16:30	10	3	6	42	5	3	74	65	1	8	58	36	311	1206	2		2	1
16:30 - 16:45	16	3	8	32	1	3	65	35	3	18	54	37	275	1183	2		1	2
16:45 - 17:00	23	3	14	41	1	6	62	90	2	16	65	33	356	1201	6			2
17:00 - 17:15	17	1	5	27	7	9	64	73		9	51	47	310	1252	4		1	2
17:15 - 17:30	13	6	4	24		5	61	54		9	47	48	271	1212	2			
17:30 - 17:45	10	2	7	36	1	9	56	62		9	61	35	288	1225			1	2
17:45 - 18:00	10	1	10	37	3	6	50	66		5	43	25	256	1125	2			3
SUB TOTAL	167	30	80	409	23	68	772	746	12	134	669	456	3566		31	23	11	23

TOTAL	405	81	290	853	83	138	1813	1850	86	400	1630	1091	8720		41	47	14	29
AVGE VOL	45	9	32	95	9	15	201	206	10	44	181	121	969		5	5	2	3

Vehicle Turning Movement Survey

TOTAL

N/S Street: Wiebe Rd

Observer: Clark Pollard & Diane Allen

E/W Street: Range Rd

Notes:

LOCATION: _____

Speed Limit Major Street: 50 km/h
Speed Limit Minor Street: 50 km/h

DATE: Saturday March 22/08 & Tuesday April 8/08

WEATHER: windy/sunny

TOTAL HOURS = 9

Tuesday	North Approach			South Approach			East Approach			West Approach			Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
6:00 - 6:15						1	3	6			5	2	17					
6:15 - 6:30				1				3			1		5					
6:30 - 6:45				4			1	2			4	3	14					
6:45 - 7:00				1		1		3			1	3	9	45				
7:00 - 7:15				2			4	5			5	1	17	45				
7:15 - 7:30				4		1	4	9			10	1	29	69				
7:30 - 7:45				5		4	2	13			5	4	33	88		2		
7:45 - 8:00				3		3	2	18			13	11	50	129		2		1
8:00 - 8:15				4		1	3	20			12	3	43	155		2		1
8:15 - 8:30				5		1	7	30			14	5	62	188				
8:30 - 8:45				5			9	22			10	2	48	203				
8:45 - 9:00				3		1	3	14			11	6	38	191		1		
SUB TOTAL				37		13	38	145			91	41	365			7		2

Saturday													Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
11:00 - 11:15				42		1	4	41			31	34	153					
11:15 - 11:30				60		13	11	43			32	37	196					
11:30 - 11:45				55		2	3	32			19	30	141			1		
11:45 - 12:00				77		5	9	50			30	53	224	714		3		
12:00 - 12:15				55		6	4	47			27	30	169	730		1		
12:15 - 12:30				62		12	6	78			31	36	225	759		3		
12:30 - 12:45				43		5	11	24			17	15	115	733		1		
12:45 - 13:00				43		1	5	33			20	29	131	640				
13:00 - 13:15				43		1	7	38			24	41	154	625		5		
13:15 - 13:30				61		5	7	42			26	29	170	570				
13:30 - 13:45				66		3	13	53			31	49	215	670				
13:45 - 14:00				61		3	12	49			38	28	191	730		3		
SUB TOTAL				668		57	92	530			326	411	2084			17		

Tuesday													Total	Hourly	Pedestrian			
TIME	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	Volume	Volume	N	S	E	W
15:00 - 15:15				16		2	11	43			14	16	102					
15:15 - 15:30				28		2	6	33			13	22	104					
15:30 - 15:45				35		2	7	30			28	20	122			3		
15:45 - 16:00				30		1	11	35			19	28	124	452				
16:00 - 16:15				20		1	8	28			15	21	93	443		1		1
16:15 - 16:30				35		4	8	33			28	10	118	457		1		
16:30 - 16:45				24		2	14	37			22	18	117	452				
16:45 - 17:00				27		2	11	28			11	24	103	431			2	
17:00 - 17:15				28		2	11	38			26	21	126	464				
17:15 - 17:30				26		1	11	26			24	16	104	450			1	
17:30 - 17:45				40		5	15	20			23	27	130	463			3	
17:45 - 18:00				29		3	6	25			19	19	101	461				
SUB TOTAL				338		27	119	376			242	242	1344			11		1

TOTAL				1043		97	249	1051			659	694	3793			35	1	2
AVGE VOL				116		11	28	117			73	77	421			4	0	0

2023 Future Background Volumes

Traffic Volumes
2023 Background Volumes

Rate	Years	341			170
Normalizing	2.0%	0	50	124	98
Future	1.5%	15	0	0	0
Growth Factor	1.25		63	155	123

497	27	0	34	Vestwood Dr & Massey Dr	
	371	0	464		
574	61	0	76		

By: B. Kwok	166	125	221	Where: Westwood Dr & Massey Dr	
Proj: PGCC TIS	5	2	0	SrvDt: Tue Apr 1/08	
Time: AM Pk Hour	128	98	177	SrvTi: 8:00-9:00	
City: Prince George, BC			512		

Rate	Years	410			682
Normalizing	2.0%	0	0	240	88
Future	1.5%	15	0	0	0
Growth Factor	1.25		0	300	110

0	0	0	0	ey Dr & Pine Centre Frontage	
0	0	0	0		
0	0	0	0		

By: B. Kwok	0	648	71	Where: Massey Dr & Pine Centre Frontage	
Proj: PGCC TIS	0	0	0	SrvDt: Tue Apr 1/08	
Time: AM Pk Hour	0	518	57	SrvTi: 8:00-9:00	
City: Prince George, BC	300		719		

Rate	Years	101			224
Normalizing	2.0%	0	81	0	0
Future	1.5%	15	0	0	0
Growth Factor	1.25		101	0	0

101	0	0	0	ry 97 Ramp & RecPlace Dr	
0	0	0	0		
0	0	0	0		

By: B. Kwok	0	0	0	Where: Hwy 97 Ramp & RecPlace Dr	
Proj: PGCC TIS	0	0	0	SrvDt: Wed Apr 2/08	
Time: AM Pk Hour	0	0	0	SrvTi: 8:00-9:00	
City: Prince George, BC	0		0		

Rate	Years	383			689
Normalizing	2.0%	0	18	155	92
Future	1.5%	15	0	51	0
Growth Factor	1.25		23	245	115

1,191	16	0	20	Hwy 16 & Hwy 97	
	550	0	688		
1,118	293	44	410		

By: B. Kwok	95	0	76	Where: Hwy 16 & Hwy 97	
Proj: PGCC TIS	578	0	462	SrvDt: Wed Apr 2/08	
Time: AM Pk Hour	79	0	63	SrvTi: 7:30-8:30	
City: Prince George, BC	734		1,252		

Rate	Years	742			1,580
Normalizing	2.0%	0	15	502	0
Future	1.5%	15	95	0	0
Growth Factor	1.25		114	628	0

119	0	0	0	Hwy 16 & Playhouse Access	
	0	0	0		
	0	0	0		

By: B. Kwok	0	0	0	Where: Hwy 16 & Playhouse Access	
Proj: PGCC TIS	0	43	0	SrvDt: Tue Apr 8/08	
Time: AM Pk Hour	4	1,229	70	SrvTi: 8:00-9:00	
City: Prince George, BC	639		1,585		

Rate	Years	249			500
Normalizing	2.0%	0	6	121	72
Future	1.5%	15	0	0	0
Growth Factor	1.25		8	151	90

208	28	0	35	Vestwood Dr & Ferry Ave	
	143	21	200		
316	65	0	81		

By: B. Kwok	55	291	90	Where: Westwood Dr & Ferry Ave	
Proj: PGCC TIS	0	0	0	SrvDt: Thu Apr 3/08	
Time: AM Pk Hour	44	233	72	SrvTi: 7:45-8:45	
City: Prince George, BC	298		436		

Rate	Years	141			84
Normalizing	2.0%	0	11	1	25
Future	1.5%	15	16	0	79
Growth Factor	1.25		30	1	110

365	30	21	59	RecPlace Dr & Ferry Ave	
	258	0	323		
452	56	0	70		

By: B. Kwok	29	22	3	Where: RecPlace Dr & Ferry Ave	
Proj: PGCC TIS	0	21	0	SrvDt: Tue Apr 8/08	
Time: AM Pk Hour	23	1	2	SrvTi: 8:00-9:00	
City: Prince George, BC	167		54		

Rate	Years	32			53
Normalizing	2.0%	0	0	0	0
Future	1.5%	15	32	0	0
Growth Factor	1.25		32	0	0

414	0	0	0	Anthem Dr & Ferry Ave	
	381	79	460		
460	0	0	0		

By: B. Kwok	0	0	0	Where: Anthem Dr & Ferry Ave	
Proj: PGCC TIS	0	0	0	SrvDt:	
Time: AM Pk Hour	0	0	0	SrvTi:	
City: Prince George, BC	0		0		

Rate	Years	539			1,739
Normalizing	2.0%	0	37	341	49
Future	1.5%	15	0	4	2
Growth Factor	1.25		46	430	63

435	58	43	116	Hwy 16 & Ferry Ave	
	195	6	250		
460	51	29	93		

By: B. Kwok	164	1,544	690	Where: Hwy 16 & Ferry Ave	
Proj: PGCC TIS	34	0	0	SrvDt: Thu Apr 3/08	
Time: AM Pk Hour	104	1,235	552	SrvTi: 7:45-8:45	
City: Prince George, BC	920		2,398		

Rate	Years	112			293
Normalizing	2.0%	0	13	50	26
Future	1.5%	15	0	0	0
Growth Factor	1.25		16	63	33

87	58	0	73	Vestwood Dr & Range Rd	
	39	0	49		
163	33	0	41		

By: B. Kwok	40	131	1	Where: Westwood Dr & Range Rd	
Proj: PGCC TIS	0	0	0	SrvDt: Mon Apr 7/08	
Time: AM Pk Hour	32	105	1	SrvTi: 7:45-8:45	
City: Prince George, BC	105		172		

Rate	Years	0			0
Normalizing	2.0%	0	0	0	0
Future	1.5%	15	0	0	0
Growth Factor	1.25		0	0	0

134	0	0	0	Wiebe Rd & Range Rd	
	49	0	61		
87	21	0	26		

By: B. Kwok	21	0	6	Where: Wiebe Rd & Range Rd	
Proj: PGCC TIS	0	0	0	SrvDt: Tue Apr 8/08	
Time: AM Pk Hour	17	0	5	SrvTi: 7:45-8:45	
City: Prince George, BC	52		27		

Rate	Years	863			2,134
Normalizing	2.0%	0	39	624	0
Future	1.5%	15	0	34	0
Growth Factor	1.25		49	814	0

132	0	0	0	0 6 & Range Rd	
	0	0	0		
49	39	0	49		

By: B. Kwok	83	2,134	0	Where: Hwy 16 & Range Rd	
Proj: PGCC TIS	0	34	0	SrvDt: Mon Apr 7/08	
Time: AM Pk Hour	66	1,680	0	SrvTi: 8:00-9:00	
City: Prince George, BC	863		2,217		

2023 Full Development Trip Distribution

AM Peak Hours – Development Only

Traffic Volumes
Full Development Site Generated Traffic Scenario III

Normalizing	Rate	Years	16	34	xxx
Future	0	0	0	0	0
Growth Factor	0	16	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
0	0	0
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
0	0	0
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
0	0	0
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	146	72	xxx
Future	0	0	0	0	0
Growth Factor	0	146	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
0	0	0
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	74	167	xxx
Future	0	0	5	0	0
Growth Factor	0	69	5	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
4	0	4
0	0	0
2	0	2

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
5	8

OUT	IN
118	68

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
47	0	47
0	0	0
27	0	27

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
74	73

Normalizing	Rate	Years	70	167	xxx
Future	0	27	43	0	0
Growth Factor	0	27	43	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
79	79	0
9	9	0
30	30	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	118	68	xxx
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
0	0	0
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	27	172	xxx
Future	0	27	0	0	0
Growth Factor	0	27	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
0	0	0
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
27	172

Normalizing	Rate	Years	57	112	xxx
Future	0	0	3	0	0
Growth Factor	0	54	3	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
21	0	21
0	0	0
10	0	10

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
31	6

Normalizing	Rate	Years	27	172	xxx
Future	0	27	0	0	0
Growth Factor	0	27	0	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
39	0	39
0	0	0
22	0	22

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
61	119

Normalizing	Rate	Years	64	95	xxx
Future	0	0	3	0	0
Growth Factor	0	61	3	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
31	0	30.561
0	0	0
18	0	17.567

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
48	7

OUT	IN
68	39

Normalizing	Rate	Years	49	252	xxx
Future	0	0	0	0	0
Growth Factor	0	21	29	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
130	130	0
0	0	0
21	21	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
29	119

Normalizing	Rate	Years	64	95	xxx
Future	0	0	3	0	0
Growth Factor	0	61	3	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
0	0	0
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	68	39	xxx
Future	0	0	33	0	0
Growth Factor	0	36	33	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
22	0	22
32	0	32
18	0	18

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	42	122	xxx
Future	0	0	21	0	0
Growth Factor	0	21	21	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
8	0	8
0	0	0
12	0	12

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
20	38

Normalizing	Rate	Years	79	69	xxx
Future	0	0	0	0	0
Growth Factor	0	15	41	23	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
46	46	0
40	40	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	136	105	xxx
Future	0	0	136	0	0
Growth Factor	0	0	136	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
105	0	105
0	0	0
54	0	54

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	32	130	xxx
Future	0	0	0	0	0
Growth Factor	0	19	0	13	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
61	61	0
53	53	0
115	115	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

OUT	IN
159	172

Normalizing	Rate	Years	41	13	xxx
Future	0	0	0	0	0
Growth Factor	0	31	10	0	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
28	0	28
0	0	0
0	0	0

By: B. Kwok	Proj: PGGCC TIS	Time: AM Pk Hour	City: Prince George, BC
0	0	0	0
0	0	0	0
0	0	0	0

Normalizing	Rate	Years	54	35	xxx
Future	0	0	0	0	0
Growth Factor	0	28	7	19	0

Trffic: Full Site	Ntwrk: Phase 2+H97 Connection	xxx
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Normalizing	Rate	Years	35	62	xxx
Future	0	0	0	0	0
Growth Factor	0	35	0	0	0
Westwood Dr & Massey Dr					
0	0	0	0	0	3
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	90	62	111	111	
Proj: PGGCC TIS	90	62	111	111	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	107			263	

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
Massey Dr & Pine Centre Frontage					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	111	106	106	106	
Proj: PGGCC TIS	111	106	106	106	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	5			106	

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
Hwy 97 Ramp & RecPlace Dr					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	0	0	0	0	
Proj: PGGCC TIS	0	0	0	0	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	0			0	

Normalizing	Rate	Years	168	74	xxx
Future	0	0	0	0	0
Growth Factor	0	168	0	0	0
Hwy 16 & Hwy 97					
0	0	0	0	0	14
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	23	74	0	14	
Proj: PGGCC TIS	23	74	0	14	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	247			97	

Normalizing	Rate	Years	107	263	xxx
Future	0	0	5	0	0
Growth Factor	0	107	5	0	0
Westwood Dr & TZ 1					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	0	259	3	263	
Proj: PGGCC TIS	0	259	3	263	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	104			3	

5 OUT	TZ 1
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OUT	TZ 2	IN
118		68

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
RecPlace Dr & TZ 4					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	0	0	0	0	
Proj: PGGCC TIS	0	0	0	0	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	74			73	

74 OUT	TZ 1
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Normalizing	Rate	Years	74	73	xxx
Future	0	0	0	0	0
Growth Factor	0	74	0	0	0
RecPlace Dr & Athlone Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	135	24	24	73	
Proj: PGGCC TIS	135	24	24	73	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	75			129	

Normalizing	Rate	Years	118	68	xxx
Future	0	0	24	0	0
Growth Factor	0	118	24	0	0
TZ 2 & Athlone Ave					
32	0	32	36	0	135
0	0	56	56	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	88	0	0	0	
Proj: PGGCC TIS	88	0	0	0	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	0			80	

Normalizing	Rate	Years	104	263	xxx
Future	0	0	0	0	0
Growth Factor	0	104	26	78	0
Westwood Dr & Athlone Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	15	161	161	0	193
Proj: PGGCC TIS	15	161	161	0	193
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	42			88	

31 OUT	TZ 2
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6 IN	TZ 2
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Normalizing	Rate	Years	75	129	xxx
Future	0	0	24	0	0
Growth Factor	0	75	24	0	0
RecPlace Dr & TZ 5					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	0	91	95	119	
Proj: PGGCC TIS	0	91	95	119	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	73			185	

61 OUT	TZ 2
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119 IN	TZ 2
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Normalizing	Rate	Years	73	185	xxx
Future	0	0	47	0	0
Growth Factor	0	73	47	0	0
RecPlace Dr & Playhouse Access					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	0	64	0	47	
Proj: PGGCC TIS	0	64	0	47	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	42			64	

Normalizing	Rate	Years	247	97	xxx
Future	0	0	0	0	0
Growth Factor	0	247	120	0	0
Hwy 16 & Playhouse Access					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	138	0	0	0	
Proj: PGGCC TIS	138	0	0	0	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	47			109	

Normalizing	Rate	Years	49	94	xxx
Future	0	0	3	0	0
Growth Factor	0	49	3	0	0
Westwood Dr & Laurel Cres					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	0	63	4	94	
Proj: PGGCC TIS	0	63	4	94	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	63			68	

48 OUT	TZ 8
--------	------

OUT	TZ 7	IN
68		39

Normalizing	Rate	Years	42	64	xxx
Future	0	0	24	0	0
Growth Factor	0	42	24	0	0
RecPlace Dr & TZ 6					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	0	60	14	64	
Proj: PGGCC TIS	0	60	14	64	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	34			74	

20 OUT	TZ 6
--------	------

38 IN	TZ 6
-------	------

Normalizing	Rate	Years	63	68	xxx
Future	0	0	0	0	0
Growth Factor	0	63	28	22	0
Westwood Dr & Ferry Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	65	7	7	68	
Proj: PGGCC TIS	65	7	7	68	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	28			9	

Normalizing	Rate	Years	68	39	xxx
Future	0	0	28	0	0
Growth Factor	0	68	28	0	0
Ryan Rd & Ferry Ave					
17	0	17	22	0	82
0	0	39	39	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	70	14	0	14	
Proj: PGGCC TIS	70	14	0	14	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	32			48	

32 IN	TZ 9	48 OUT
-------	------	--------

Normalizing	Rate	Years	34	74	xxx
Future	0	0	0	0	0
Growth Factor	0	34	19	0	0
RecPlace Dr & Ferry Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	82	14	14	74	
Proj: PGGCC TIS	82	14	14	74	
Time: AM Pk Hour	0	0	0	0	
City: Prince George, BC	136			105	

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
Anthem Dr & Ferry Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok	160	0	0	0	
Proj: PGGCC TIS	160	0	0	0	

PM Peak Hours – Development Only

Normalizing	Rate	Years	106	168	xxx
Future	0	0	0	0	0
Growth Factor	0	106	0	0	0
237					
0	0	0	0	0	11
0	0	0	0	0	0
0	0	0	0	0	0
Westwood Dr & Massey Dr					
0	0	0	0	0	11
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
325	237	168	269	269	269

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
11					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Massey Dr & Pine Centre Frontage					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
269	262	262	262	262	262

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Hwy 97 Ramp & RecPlace Dr					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
0	0	0	0	0	0

Normalizing	Rate	Years	542	258	xxx
Future	0	0	0	0	0
Growth Factor	0	542	0	0	0
88					
0	0	0	0	0	42
0	0	0	0	0	0
0	0	0	0	0	0
Hwy 16 & Hwy 97					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
805	88	258	0	0	0

Normalizing	Rate	Years	325	674	xxx
Future	0	0	18	0	0
Growth Factor	0	306	18	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Westwood Dr & TZ 1					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
317	0	650	13	13	13

34	OUT	TZ 1
32	IN	

OUT	TZ 2	IN
143		168

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RecPlace Dr & TZ 4					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
275	0	0	173	173	173

275	OUT	TZ 4
173	IN	

Normalizing	Rate	Years	317	664	xxx
Future	0	0	0	0	0
Growth Factor	0	95	221	0	0
40					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Westwood Dr & Athlone Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
134	0	164	28	28	28

Normalizing	Rate	Years	143	168	xxx
Future	114	0	29	0	0
Growth Factor	114	0	29	0	0
578					
79	0	79	0	0	0
40	0	170	170	0	0
38	38	0	0	0	0
TZ 2 & Athlone Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
249	0	0	0	0	199

Normalizing	Rate	Years	275	173	xxx
Future	0	0	0	0	0
Growth Factor	202	73	0	0	0
553					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RecPlace Dr & Athlone Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
199	0	141	141	0	0

Normalizing	Rate	Years	214	467	xxx
Future	0	0	85	0	0
Growth Factor	0	129	85	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RecPlace Dr & TZ 5					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
261	0	237	334	334	334

362	OUT	TZ 5
419	IN	

Normalizing	Rate	Years	134	191	xxx
Future	0	0	13	0	0
Growth Factor	0	121	13	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Westwood Dr & Fairview Cres					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
125	0	183	13	13	13

13	OUT	TZ 6
26	IN	

Normalizing	Rate	Years	261	570	xxx
Future	0	0	0	0	0
Growth Factor	0	96	166	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RecPlace Dr & Playhouse Access					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
154	0	205	0	0	0

Normalizing	Rate	Years	214	467	xxx
Future	0	0	85	0	0
Growth Factor	0	129	85	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RecPlace Dr & TZ 5					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
261	0	237	334	334	334

121	OUT	TZ 6
134	IN	

Normalizing	Rate	Years	125	196	xxx
Future	0	0	12	0	0
Growth Factor	0	114	12	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Westwood Dr & Laurel Cres					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
121	0	183	16	16	16

21	OUT	TZ 8
28	IN	

OUT	TZ 7	IN
142		141

Normalizing	Rate	Years	154	205	xxx
Future	0	0	85	0	0
Growth Factor	0	69	85	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RecPlace Dr & TZ 6					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
163	0	178	49	49	49

Normalizing	Rate	Years	0	0	0
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Anthem Dr & Ferry Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
531	0	531	531	531	531

595	OUT	TZ 9
586	IN	

Normalizing	Rate	Years	121	199	xxx
Future	0	0	0	0	0
Growth Factor	21	35	66	0	0
176					
0	21	21	0	0	0
0	160	160	0	0	0
0	0	0	0	0	0
Westwood Dr & Ferry Ave					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
By: B. Kwok Proj: PGGCC TIS Time: PM Pk Hour City: Prince George, BC					
35	0	28	0	0	0

Normalizing	Rate	Years	142	141	xxx
Future	84	0	58	0	0
Growth Factor	84	0	58	0	0
304					
61	0	61	0	0	0
0	118	118	0	0	0
0	0	0	0	0	0

Saturday Peak Hours – Development Only

Traffic Volumes
Full Development Site Generated Traffic Scenario III

Normalizing	Rate	Years	57	55	xxx
Future	0	0	0	0	0
Growth Factor	0	57	0	0	0
125					
0	0	0	0	0	78
0	0	0	0	0	78
0	0	0	0	0	117
Westwood Dr & Massey Dr					
By: B. Kwok	125	55	117		
Proj: PGGCC TIS	125	55	117		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	261		296		

Normalizing	Rate	Years	0	0	xxx
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
78					
0	0	0	0	0	78
0	0	0	0	0	103
0	0	0	0	0	103
Ferry Dr & Pine Centre Frontage					
By: B. Kwok	117	14	14		
Proj: PGGCC TIS	0	0	0		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	14		0		

Normalizing	Rate	Years	0	0	xxx
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
491					
0	0	0	0	0	306
0	0	0	0	0	103
0	0	0	0	0	0
Hwy 97 Ramp & RecPlace Dr					
By: B. Kwok	306	306	0	797	
Proj: PGGCC TIS	491	491	0		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	0		0		

Normalizing	Rate	Years	681	308	xxx
Future	0	0	0	0	0
Growth Factor	0	681	0	0	0
0					
0	0	0	0	0	47
0	0	0	0	0	47
0	0	0	0	0	0
Hwy 16 & Hwy 97					
By: B. Kwok	485	485	0	308	0
Proj: PGGCC TIS	0	308	0		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	1,213		308		

Normalizing	Rate	Years	261	296	xxx
Future	0	0	29	0	0
Growth Factor	0	232	29	0	0
0					
0	0	0	0	0	42
0	0	0	0	0	13
0	0	0	0	0	46
Westwood Dr & TZ 1					
By: B. Kwok	0	267	17		
Proj: PGGCC TIS	0	267	17		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	245		284		

Normalizing	Rate	Years	176	193	xxx
Future	0	0	0	0	0
Growth Factor	0	176	0	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
TZ 2					
OUT	176		IN	193	

Normalizing	Rate	Years	0	0	xxx
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
0					
0	0	0	0	0	239
0	0	0	0	0	123
0	0	0	0	0	239
RecPlace Dr & TZ 4					
By: B. Kwok	0	583	239		
Proj: PGGCC TIS	0	583	239		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	123		822		

Normalizing	Rate	Years	0	0	xxx
Future	0	0	0	0	0
Growth Factor	0	0	0	0	0
0					
0	0	0	0	0	239
0	0	0	0	0	123
0	0	0	0	0	239
Where: RecPlace Dr & TZ 4					
SrvDt:	0	583	239		
SrvTl:	0	0	0		

Normalizing	Rate	Years	245	284	xxx
Future	0	0	0	0	0
Growth Factor	0	122	122	0	0
13					
0	0	0	0	0	118
0	0	0	0	0	13
0	0	0	0	0	45
Westwood Dr & Athlone Ave					
By: B. Kwok	0	166	70		
Proj: PGGCC TIS	0	166	70		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	167		236		

Normalizing	Rate	Years	176	193	xxx
Future	0	0	0	0	0
Growth Factor	0	176	0	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
TZ 2 & Athlone Ave					
By: B. Kwok	193	0	193		
Proj: PGGCC TIS	0	0	0		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	0		0		

Normalizing	Rate	Years	123	822	xxx
Future	0	0	0	0	0
Growth Factor	0	123	0	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
RecPlace Dr & Athlone Ave					
By: B. Kwok	0	822	0		
Proj: PGGCC TIS	0	822	0		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	123		822		

Normalizing	Rate	Years	123	822	xxx
Future	0	0	0	0	0
Growth Factor	0	123	0	0	0
0					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Where: RecPlace Dr & Athlone Ave					
SrvDt:	0	822	0		
SrvTl:	0	0	0		

Normalizing	Rate	Years	167	236	xxx
Future	0	0	11	0	0
Growth Factor	0	156	11	0	0
0					
0	0	0	0	0	13
0	0	0	0	0	19
0	0	0	0	0	6
Westwood Dr & Fairview Cres					
By: B. Kwok	0	223	12		
Proj: PGGCC TIS	0	223	12		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	163		235		

Normalizing	Rate	Years	193	22	xxx
Future	0	0	0	0	0
Growth Factor	0	193	0	0	0
0					
0	0	0	0	0	19
0	0	0	0	0	22
0	0	0	0	0	0
Where: Westwood Dr & Fairview Cres					
SrvDt:	0	223	12		
SrvTl:	0	0	0		

Normalizing	Rate	Years	123	822	xxx
Future	0	0	0	0	0
Growth Factor	0	123	0	0	0
0					
0	0	0	0	0	288
0	0	0	0	0	454
0	0	0	0	0	166
RecPlace Dr & TZ 5					
By: B. Kwok	0	534	616		
Proj: PGGCC TIS	0	534	616		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	288		1,150		

Normalizing	Rate	Years	123	822	xxx
Future	0	0	0	0	0
Growth Factor	0	123	0	0	0
0					
0	0	0	0	0	288
0	0	0	0	0	454
0	0	0	0	0	166
Where: RecPlace Dr & TZ 5					
SrvDt:	0	534	616		
SrvTl:	0	0	0		

Normalizing	Rate	Years	163	235	xxx
Future	0	0	10	0	0
Growth Factor	0	153	10	0	0
0					
0	0	0	0	0	21
0	0	0	0	0	195
0	0	0	0	0	33
Westwood Dr & Laurel Cres					
By: B. Kwok	0	214	13		
Proj: PGGCC TIS	0	214	13		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	165		227		

Normalizing	Rate	Years	185	174	xxx
Future	0	0	88	0	0
Growth Factor	0	97	88	0	0
0					
0	0	0	0	0	99
0	0	0	0	0	341
0	0	0	0	0	161
Ryan Rd & Ferry Ave					
By: B. Kwok	316	0	99	341	
Proj: PGGCC TIS	75	0	75		
Time: Sat Pk Hour	0	188	188		
City: Prince George, BC	325	62	0	371	

Normalizing	Rate	Years	288	1,150	xxx
Future	0	0	168	0	0
Growth Factor	0	120	168	0	0
0					
0	0	0	0	0	579
0	0	0	0	0	689
0	0	0	0	0	111
RecPlace Dr & Playhouse Access					
By: B. Kwok	0	571	0		
Proj: PGGCC TIS	0	571	0		
Time: Sat Pk Hour	0	0	0		
City: Prince George, BC	231		571		

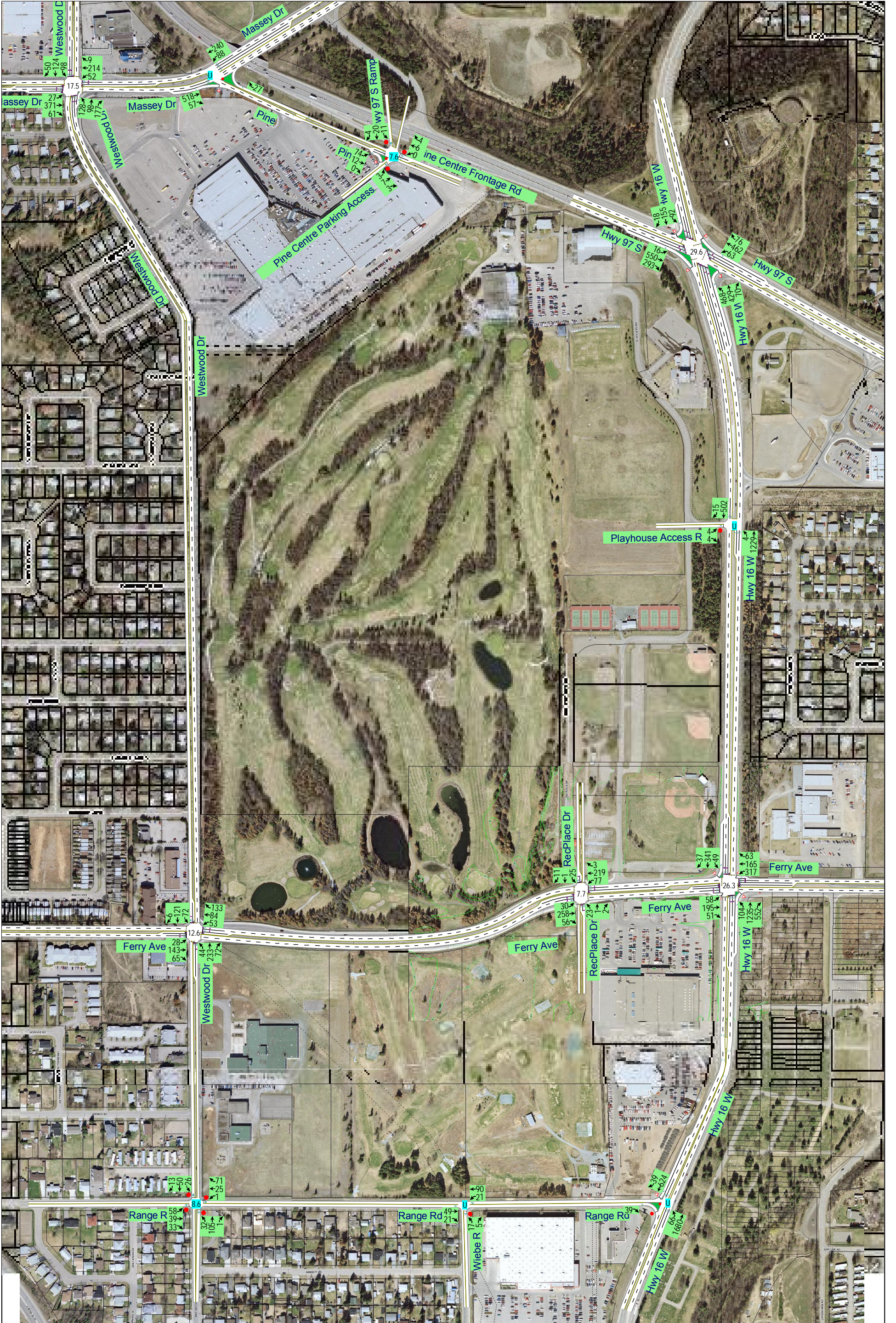
Normalizing	Rate	Years	288	1,150	xxx
Future	0	0	0	0	0
Growth Factor	0	120	168	0	0
0					
0	0	0	0	0	579
0	0	0	0	0	689
0	0	0	0	0	111
Where: RecPlace Dr & Playhouse Access					
SrvDt:	0	571	0		
SrvTl:	0	0	0		

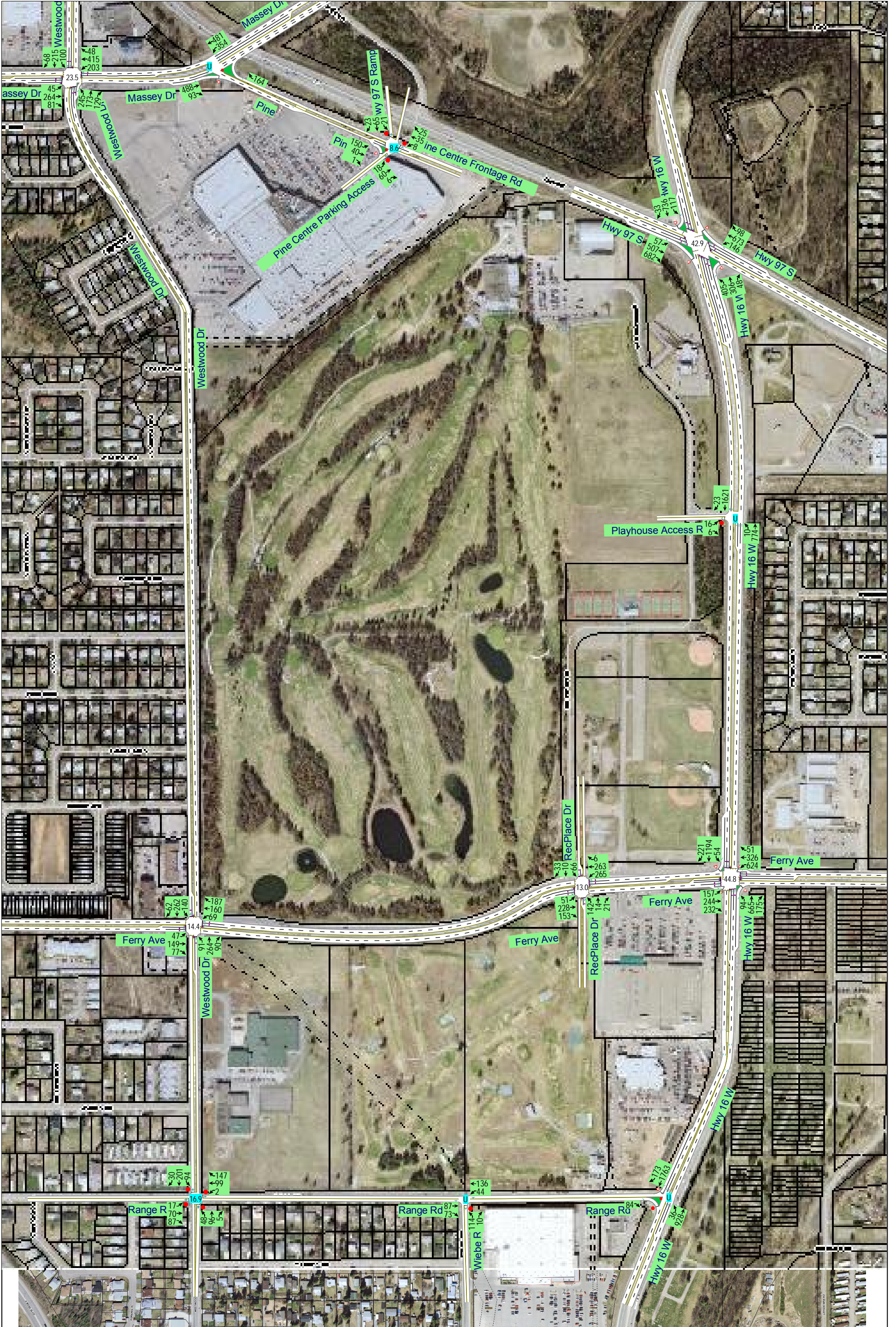
Normalizing	Rate	Years	1,213	308	xxx
Future	0	0	0	0	0
Growth Factor	0	637	576	0	0
689					
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
Hwy 16 & Playhouse Access					
By: B. Kwok	168	0	168	168	
Proj: PGGCC TIS	0	52	308	0	
Time: Sat Pk Hour	0	0	0	0	
City: Prince George, BC	744		360		

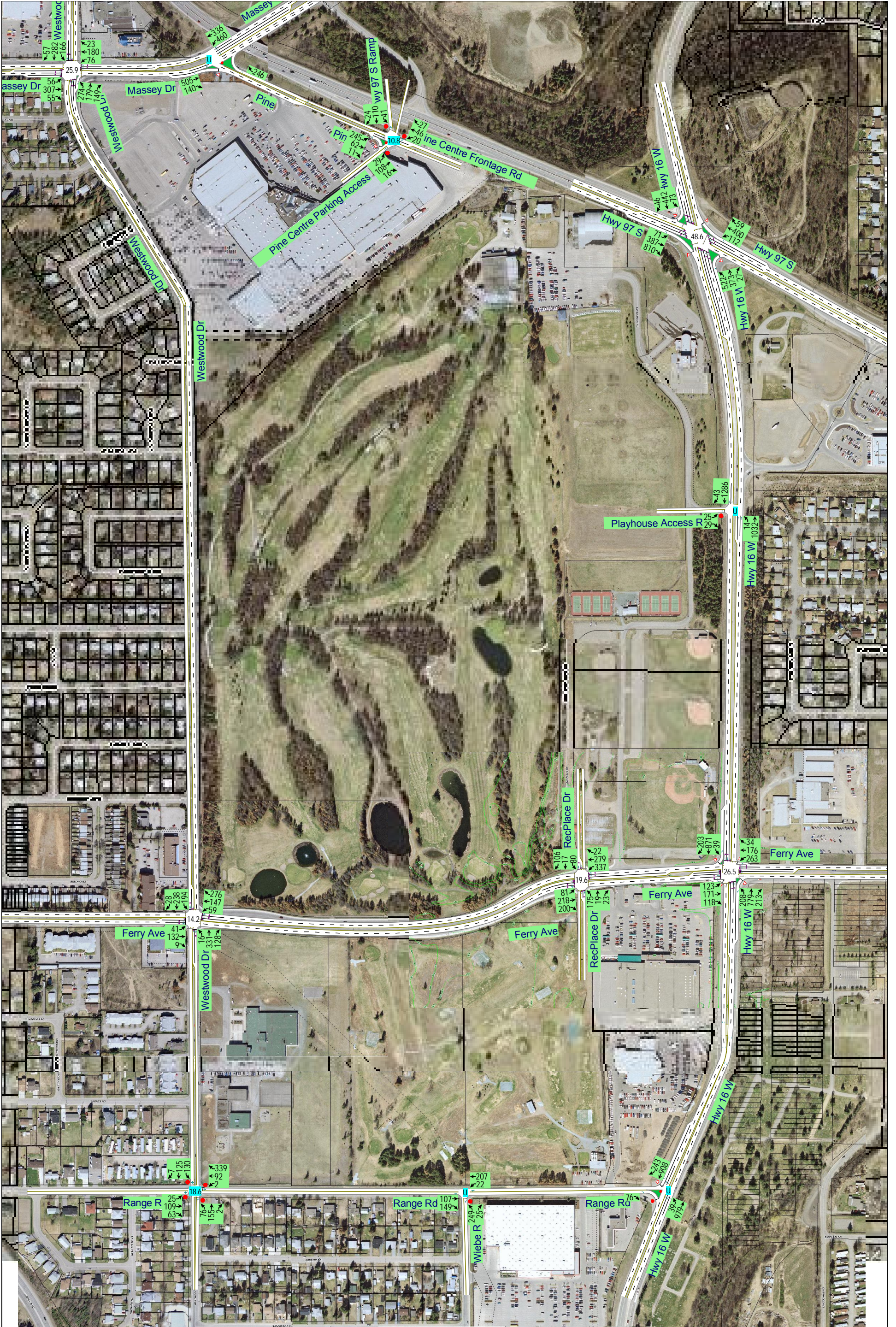
Normalizing	Rate	Years	163	235	xxx
Future	0	0	10	0	0
Growth Factor	0	153	10		

Appendix II
Level of Service Assessments – Synchro Results

2008 Existing Conditions



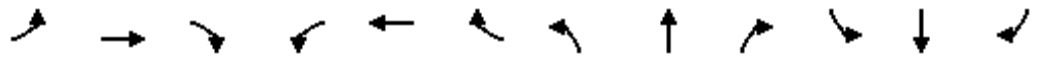




HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	550	293	63	462	76	468	429	70	92	155	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	7.0	5.5	7.0	7.0	7.6	6.6	6.6	7.0	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1694	3539	1686	1713	3506	1729	3366	3624	1639	1724	3564	1667
Flt Permitted	0.45	1.00	1.00	0.26	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	798	3539	1686	472	3506	1729	3366	3624	1639	1724	3564	1667
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	18	625	333	72	525	86	532	488	80	105	176	20
RTOR Reduction (vph)	0	0	234	0	0	57	0	0	59	0	0	17
Lane Group Flow (vph)	18	625	99	72	525	29	532	488	21	105	176	3
Confl. Peds. (#/hr)	1					1	9		2	2		9
Heavy Vehicles (%)	6%	6%	8%	6%	7%	4%	3%	3%	9%	2%	2%	6%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	30.8	28.5	28.5	38.6	32.4	32.4	18.6	24.7	24.7	10.3	15.8	15.8
Effective Green, g (s)	30.8	28.5	28.5	38.6	32.4	32.4	18.6	24.7	24.7	10.3	15.8	15.8
Actuated g/C Ratio	0.32	0.30	0.30	0.40	0.34	0.34	0.19	0.26	0.26	0.11	0.16	0.16
Clearance Time (s)	5.5	7.0	7.0	5.5	7.0	7.0	7.6	6.6	6.6	7.0	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	1053	502	270	1186	585	654	934	423	185	588	275
v/s Ratio Prot	0.00	c0.18		c0.02	c0.15		c0.16	0.13		c0.06	c0.05	
v/s Ratio Perm	0.02		0.06	0.09		0.02			0.01			0.00
v/c Ratio	0.06	0.59	0.20	0.27	0.44	0.05	0.81	0.52	0.05	0.57	0.30	0.01
Uniform Delay, d1	22.3	28.7	25.1	18.7	24.7	21.3	36.9	30.5	26.7	40.6	35.1	33.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	1.4	0.4	0.5	0.6	0.1	7.7	0.5	0.0	4.0	0.3	0.0
Delay (s)	22.4	30.1	25.5	19.2	25.2	21.4	44.6	31.0	26.8	44.6	35.4	33.5
Level of Service	C	C	C	B	C	C	D	C	C	D	D	C
Approach Delay (s)		28.4			24.1			37.3			38.5	
Approach LOS		C			C			D			D	

Intersection Summary

HCM Average Control Delay	31.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	95.8	Sum of lost time (s)	40.7
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	4	4	1229	502	15
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	5	5	5	1463	598	18
Pedestrians					3	
Lane Width (m)					3.4	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1351	308	615			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1351	308	615			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	99	100			
cM capacity (veh/h)	144	694	974			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	10	5	732	732	398	217
Volume Left	5	5	0	0	0	0
Volume Right	5	0	0	0	0	18
cSH	238	974	1700	1700	1700	1700
Volume to Capacity	0.04	0.00	0.43	0.43	0.23	0.13
Queue Length 95th (m)	0.9	0.1	0.0	0.0	0.0	0.0
Control Delay (s)	20.8	8.7	0.0	0.0	0.0	0.0
Lane LOS	C	A				
Approach Delay (s)	20.8	0.0			0.0	
Approach LOS	C					
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			44.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↕	↖	↖↗	↕	↖	↖	↕	↖	↖	↕	↖
Volume (vph)	58	195	51	317	165	63	104	1235	552	49	341	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.8	6.3	5.8	5.8	5.9	6.0	6.0	5.7	6.0	6.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3697	1583	3292	3450	1568	1764	3622	1830	1675	3583	1806
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.50	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)	3236	3697	1583	3292	3450	1568	929	3622	1830	187	3583	1806
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	63	212	55	345	179	68	113	1342	600	53	371	40
RTOR Reduction (vph)	0	0	43	0	0	55	0	0	316	0	0	24
Lane Group Flow (vph)	63	212	12	345	179	13	113	1342	284	53	371	16
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	2%	2%	4%	0%	3%	0%	3%	0%	3%	3%	0%
Turn Type	Prot		Perm	Prot		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		2	6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	5.7	10.5	10.5	13.5	18.4	18.4	46.3	39.4	39.4	43.3	37.8	37.8
Effective Green, g (s)	5.7	10.5	10.5	13.5	18.4	18.4	46.3	39.4	39.4	43.3	37.8	37.8
Actuated g/C Ratio	0.06	0.11	0.11	0.15	0.20	0.20	0.50	0.43	0.43	0.47	0.41	0.41
Clearance Time (s)	6.2	5.8	5.8	6.3	5.8	5.8	5.9	6.0	6.0	5.7	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	199	419	179	479	685	311	526	1539	778	176	1461	736
v/s Ratio Prot	0.02	c0.06		c0.10	c0.05		0.02	c0.37		c0.02	0.10	
v/s Ratio Perm			0.01			0.01	0.09		0.16	0.12		0.01
v/c Ratio	0.32	0.51	0.06	0.72	0.26	0.04	0.21	0.87	0.36	0.30	0.25	0.02
Uniform Delay, d1	41.6	38.7	36.7	37.8	31.4	30.0	12.4	24.3	18.1	17.8	18.1	16.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	1.0	0.2	5.3	0.2	0.1	0.2	6.2	0.6	1.0	0.2	0.0
Delay (s)	42.6	39.6	36.9	43.1	31.6	30.1	12.6	30.6	18.7	18.8	18.3	16.4
Level of Service	D	D	D	D	C	C	B	C	B	B	B	B
Approach Delay (s)		39.7			38.1			26.1			18.2	
Approach LOS		D			D			C			B	

Intersection Summary

HCM Average Control Delay	28.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	92.7	Sum of lost time (s)	23.6
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↑↑	↖
Volume (veh/h)	0	39	66	1680	624	39
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	41	70	1787	664	41
Pedestrians				1		
Lane Width (m)				3.7		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1698	333	664			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1698	333	664			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	94	92			
cM capacity (veh/h)	78	668	921			

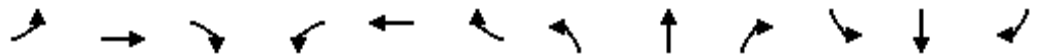
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	41	70	894	894	332	332	41
Volume Left	0	70	0	0	0	0	0
Volume Right	41	0	0	0	0	0	41
cSH	668	921	1700	1700	1700	1700	1700
Volume to Capacity	0.06	0.08	0.53	0.53	0.20	0.20	0.02
Queue Length 95th (m)	1.5	1.9	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.7	9.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	10.7	0.3			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization	56.8%		ICU Level of Service B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	27	371	61	52	214	9	128	98	177	98	124	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1651	3542	1471	1733	3488		1725	3421	1696	1761	3303	
Flt Permitted	0.60	1.00	1.00	0.47	1.00		0.56	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	1044	3542	1471	853	3488		1012	3421	1696	1269	3303	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	403	66	57	233	10	139	107	192	107	135	54
RTOR Reduction (vph)	0	0	49	0	3	0	0	0	156	0	42	0
Lane Group Flow (vph)	29	403	17	57	240	0	139	107	36	107	147	0
Confl. Peds. (#/hr)	7		10	10		7	5		5	5		5
Heavy Vehicles (%)	7%	0%	2%	0%	0%	0%	1%	2%	0%	0%	1%	4%
Turn Type	pm+pt		Perm	pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	18.1	15.9	15.9	21.1	17.4		19.4	11.7	11.7	16.6	10.3	
Effective Green, g (s)	18.1	15.9	15.9	21.1	17.4		19.4	11.7	11.7	16.6	10.3	
Actuated g/C Ratio	0.29	0.26	0.26	0.34	0.28		0.31	0.19	0.19	0.27	0.17	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	328	914	380	345	985		408	650	322	392	552	
v/s Ratio Prot	0.00	c0.11		c0.01	0.07		c0.04	0.03		0.03	0.04	
v/s Ratio Perm	0.02		0.01	0.05			c0.06		0.02	0.05		
v/c Ratio	0.09	0.44	0.04	0.17	0.24		0.34	0.16	0.11	0.27	0.27	
Uniform Delay, d1	15.6	19.1	17.2	13.8	17.0		15.7	20.9	20.7	17.5	22.4	
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	0.1	0.5	0.1	0.2	0.2		0.5	0.2	0.2	0.4	0.4	
Delay (s)	15.8	19.6	17.2	14.0	17.2		16.2	21.0	20.9	17.9	22.7	
Level of Service	B	B	B	B	B		B	C	C	B	C	
Approach Delay (s)		19.1			16.6			19.4			21.0	
Approach LOS		B			B			B			C	

Intersection Summary

HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	61.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	28	143	65	53	84	133	44	233	72	72	121	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.98	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.91		1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1718	3278		1717	3308		1740	1791		1757	2082	
Flt Permitted	0.60	1.00		0.60	1.00		0.66	1.00		0.38	1.00	
Satd. Flow (perm)	1079	3278		1090	3308		1216	1791		696	2082	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	32	164	75	61	97	153	51	268	83	83	139	7
RTOR Reduction (vph)	0	59	0	0	120	0	0	17	0	0	3	0
Lane Group Flow (vph)	32	180	0	61	130	0	51	334	0	83	143	0
Confl. Peds. (#/hr)	15		16	16		15	30		20	20		30
Heavy Vehicles (%)	0%	0%	2%	0%	2%	2%	0%	2%	1%	3%	0%	0%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		4			8			2			1	6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.2	10.2		10.2	10.2		15.6	15.6		24.5	24.5	
Effective Green, g (s)	10.2	10.2		10.2	10.2		15.6	15.6		24.5	24.5	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.33	0.33		0.52	0.52	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	236	716		238	723		406	598		454	1092	
v/s Ratio Prot		0.06			0.04			c0.19		c0.02	0.07	
v/s Ratio Perm	0.03			c0.06			0.04			0.08		
v/c Ratio	0.14	0.25		0.26	0.18		0.13	0.56		0.18	0.13	
Uniform Delay, d1	14.7	15.1		15.1	14.8		10.8	12.7		6.0	5.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.8	0.2		0.2	1.4		0.3	0.1	
Delay (s)	15.1	15.3		15.9	15.0		11.0	14.1		6.3	5.7	
Level of Service	B	B		B	B		B	B		A	A	
Approach Delay (s)		15.3			15.2			13.7			5.9	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	46.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28

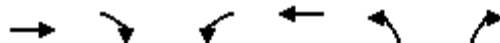


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	58	39	33	1	25	71	32	105	1	26	50	13
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	67	45	38	1	29	82	37	121	1	30	57	15
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	149	111	159	102								
Volume Left (vph)	67	1	37	30								
Volume Right (vph)	38	82	1	15								
Hadj (s)	-0.05	-0.39	0.05	-0.01								
Departure Headway (s)	4.6	4.3	4.7	4.7								
Degree Utilization, x	0.19	0.13	0.21	0.13								
Capacity (veh/h)	726	767	722	710								
Control Delay (s)	8.7	8.0	8.9	8.4								
Approach Delay (s)	8.7	8.0	8.9	8.4								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			8.6									
HCM Level of Service			A									
Intersection Capacity Utilization			32.9%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗	↖↗	↑↑		↗
Volume (veh/h)	518	57	88	240	0	27
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	640	70	109	296	0	33
Pedestrians	90			5	5	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	8			0	0	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.97	0.97	0.97	
vC, conflicting volume			645	1100	330	
vC1, stage 1 conf vol				645		
vC2, stage 2 conf vol				455		
vCu, unblocked vol			569	1039	244	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)				5.8		
tF (s)			2.2	3.5	3.3	
p0 queue free %			89	100	95	
cM capacity (veh/h)			970	315	732	

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	320	320	70	54	54	148	148	33
Volume Left	0	0	0	54	54	0	0	0
Volume Right	0	0	70	0	0	0	0	33
cSH	1700	1700	1700	970	970	1700	1700	732
Volume to Capacity	0.19	0.19	0.04	0.11	0.11	0.09	0.09	0.05
Queue Length 95th (m)	0.0	0.0	0.0	2.9	2.9	0.0	0.0	1.1
Control Delay (s)	0.0	0.0	0.0	9.2	9.2	0.0	0.0	10.2
Lane LOS				A	A	B		
Approach Delay (s)	0.0			2.5			10.2	
Approach LOS							B	

Intersection Summary

Average Delay	1.2	
Intersection Capacity Utilization	32.5%	ICU Level of Service A
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis

9: Pine Centre Frontage Rd & Hwy 97 S Ramp

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop				Stop			Stop			Stop	
Volume (vph)	74	12	0	0	6	4	3	7	3	11	20	4
Peak Hour Factor	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Hourly flow rate (vph)	109	18	0	0	9	6	4	10	4	16	29	6

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	109	18	0	0	15	19	51
Volume Left (vph)	109	0	0	0	0	4	16
Volume Right (vph)	0	0	0	0	6	4	6
Hadj (s)	0.50	0.00	0.00	0.00	-0.28	-0.09	0.04
Departure Headway (s)	5.2	4.7	3.2	4.8	4.5	4.2	4.3
Degree Utilization, x	0.16	0.02	0.00	0.00	0.02	0.02	0.06
Capacity (veh/h)	684	750	1121	752	777	814	804
Control Delay (s)	7.9	6.6	5.0	6.6	6.4	7.3	7.6
Approach Delay (s)	7.7			6.4		7.3	7.6
Approach LOS	A			A		A	A

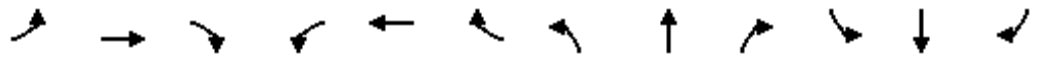
Intersection Summary

Delay	7.6
HCM Level of Service	A
Intersection Capacity Utilization	21.3%
ICU Level of Service	A
Analysis Period (min)	15

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	30	258	56	77	219	3	23	1	2	25	1	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.90		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1881	3623		1864	3724		1884	1328		1883	1687	
Flt Permitted	0.58	1.00		0.51	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (perm)	1150	3623		1010	3724		1984	1328		1983	1687	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	38	322	70	96	274	4	29	1	2	31	1	14
RTOR Reduction (vph)	0	19	0	0	1	0	0	2	0	0	13	0
Lane Group Flow (vph)	38	373	0	96	277	0	29	1	0	31	2	0
Confl. Peds. (#/hr)	5		5	5		5	1		2	2		1
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	0%	50%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	21.0	18.8		21.4	19.0		2.5	2.5		2.5	2.5	
Effective Green, g (s)	21.0	18.8		21.4	19.0		2.5	2.5		2.5	2.5	
Actuated g/C Ratio	0.52	0.46		0.53	0.47		0.06	0.06		0.06	0.06	
Clearance Time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	633	1674		581	1738		122	82		122	104	
v/s Ratio Prot	0.00	c0.10		c0.01	0.07			0.00			0.00	
v/s Ratio Perm	0.03			0.08			0.01			c0.02		
v/c Ratio	0.06	0.22		0.17	0.16		0.24	0.01		0.25	0.02	
Uniform Delay, d1	4.9	6.6		4.8	6.2		18.2	17.9		18.2	17.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.1		0.2	0.1		1.4	0.1		1.5	0.1	
Delay (s)	4.9	6.7		5.0	6.3		19.6	18.0		19.7	18.0	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		6.5			6.0			19.4			19.2	
Approach LOS		A			A			B			B	

Intersection Summary

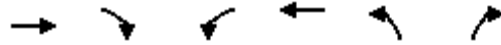
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	40.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	←	↘
Volume (veh/h)	49	21	21	90	17	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	60	26	26	110	21	6
Pedestrians	2			4		
Lane Width (m)	4.3			4.8		
Walking Speed (m/s)	1.2			1.2		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			89	240		77
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			89	240		77
tC, single (s)			4.1	6.4		6.2
tC, 2 stage (s)						
tF (s)			2.2	3.5		3.3
p0 queue free %			98	97		99
cM capacity (veh/h)			1512	736		986

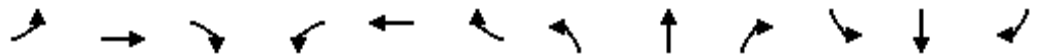
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	85	135	27
Volume Left	0	26	21
Volume Right	26	0	6
cSH	1700	1512	781
Volume to Capacity	0.05	0.02	0.03
Queue Length 95th (m)	0.0	0.4	0.8
Control Delay (s)	0.0	1.5	9.8
Lane LOS	A		A
Approach Delay (s)	0.0	1.5	9.8
Approach LOS	A		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	507	682	146	673	98	405	306	48	117	736	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	7.0	5.5	7.0	7.0	7.6	6.6	6.6	7.0	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1796	3506	1785	1780	3573	1780	3399	3660	1498	1741	3635	1763
Flt Permitted	0.27	1.00	1.00	0.27	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	506	3506	1785	514	3573	1780	3399	3660	1498	1741	3635	1763
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	551	741	159	732	107	440	333	52	127	800	36
RTOR Reduction (vph)	0	0	335	0	0	72	0	0	45	0	0	19
Lane Group Flow (vph)	62	551	406	159	732	35	440	333	7	127	800	17
Confl. Peds. (#/hr)	1					1	9					9
Heavy Vehicles (%)	0%	7%	2%	2%	5%	1%	2%	2%	21%	1%	0%	0%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)	39.2	32.8	32.8	50.0	38.2	38.2	17.5	16.1	16.1	31.0	29.0	29.0
Effective Green, g (s)	39.2	32.8	32.8	50.0	38.2	38.2	17.5	16.1	16.1	31.0	29.0	29.0
Actuated g/C Ratio	0.33	0.28	0.28	0.42	0.32	0.32	0.15	0.14	0.14	0.26	0.25	0.25
Clearance Time (s)	5.5	7.0	7.0	5.5	7.0	7.0	7.6	6.6	6.6	7.0	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	238	976	497	345	1159	577	505	500	205	458	895	434
v/s Ratio Prot	0.01	0.16		c0.05	c0.20		c0.13	0.09		0.07	c0.22	
v/s Ratio Perm	0.07		c0.23	0.15		0.02			0.00			0.01
v/c Ratio	0.26	0.56	0.82	0.46	0.63	0.06	0.87	0.67	0.03	0.28	0.89	0.04
Uniform Delay, d1	27.6	36.4	39.7	22.6	33.8	27.4	49.0	48.3	44.1	34.5	42.9	33.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	1.2	11.3	1.0	1.6	0.1	15.1	3.3	0.1	0.3	11.3	0.0
Delay (s)	28.1	37.6	51.0	23.5	35.4	27.5	64.2	51.6	44.2	34.8	54.2	33.8
Level of Service	C	D	D	C	D	C	E	D	D	C	D	C
Approach Delay (s)		44.5			32.7			57.9			50.9	
Approach LOS		D			C			E			D	

Intersection Summary

HCM Average Control Delay	45.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	117.8	Sum of lost time (s)	33.7
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	16	6	10	774	1621	23
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	7	11	841	1762	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2217	893	1787			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2217	893	1787			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	53	98	97			
cM capacity (veh/h)	37	289	351			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	24	11	421	421	1175	612
Volume Left	17	11	0	0	0	0
Volume Right	7	0	0	0	0	25
cSH	49	351	1700	1700	1700	1700
Volume to Capacity	0.49	0.03	0.25	0.25	0.69	0.36
Queue Length 95th (m)	13.8	0.7	0.0	0.0	0.0	0.0
Control Delay (s)	136.0	15.6	0.0	0.0	0.0	0.0
Lane LOS	F	C				
Approach Delay (s)	136.0	0.2			0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			55.5%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↑↑	↗	↔↔	↑↑	↗	↖	↑↑	↗	↖	↑↑	↗
Volume (vph)	157	244	232	624	326	51	94	665	175	54	1194	221
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.8	6.3	5.8	5.8	5.9	6.0	6.0	5.7	6.0	6.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3770	1581	3390	3450	1587	1765	3622	1812	1725	3654	1830
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.07	1.00	1.00	0.30	1.00	1.00
Satd. Flow (perm)	3236	3770	1581	3390	3450	1587	123	3622	1812	549	3654	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	171	265	252	678	354	55	102	723	190	59	1298	240
RTOR Reduction (vph)	0	0	107	0	0	18	0	0	107	0	0	91
Lane Group Flow (vph)	171	265	145	678	354	37	102	723	83	59	1298	149
Confl. Peds. (#/hr)	3		5	5		3						
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	3%	1%	0%	1%	0%
Turn Type	Prot		Perm	Prot		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	10.6	17.2	17.2	30.6	37.3	37.3	70.4	60.3	60.3	63.0	56.5	56.5
Effective Green, g (s)	10.6	17.2	17.2	30.6	37.3	37.3	70.4	60.3	60.3	63.0	56.5	56.5
Actuated g/C Ratio	0.08	0.12	0.12	0.22	0.27	0.27	0.51	0.44	0.44	0.46	0.41	0.41
Clearance Time (s)	6.2	5.8	5.8	6.3	5.8	5.8	5.9	6.0	6.0	5.7	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	248	469	196	750	930	428	182	1578	789	305	1492	747
v/s Ratio Prot	0.05	0.07		c0.20	0.10		c0.04	c0.20		0.01	c0.36	
v/s Ratio Perm			c0.09			0.02	0.24		0.05	0.08		0.08
v/c Ratio	0.69	0.57	0.74	0.90	0.38	0.09	0.56	0.46	0.10	0.19	0.87	0.20
Uniform Delay, d1	62.3	57.1	58.4	52.5	41.1	37.8	27.7	27.5	23.1	21.8	37.6	26.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.8	1.6	14.0	14.3	0.3	0.1	3.9	0.4	0.1	0.3	6.2	0.3
Delay (s)	70.1	58.6	72.4	66.7	41.4	37.9	31.6	28.0	23.2	22.1	43.8	26.7
Level of Service	E	E	E	E	D	D	C	C	C	C	D	C
Approach Delay (s)		66.5			57.0			27.5			40.4	
Approach LOS		E			E			C			D	

Intersection Summary

HCM Average Control Delay	45.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	138.4	Sum of lost time (s)	30.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↗
Volume (veh/h)	0	84	36	928	1763	173
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.92
Hourly flow rate (vph)	0	90	39	998	1896	188
Pedestrians	1					
Lane Width (m)	4.8					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2473	949	1897			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2473	949	1897			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	66	88			
cM capacity (veh/h)	22	263	318			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	90	39	499	499	948	948	188
Volume Left	0	39	0	0	0	0	0
Volume Right	90	0	0	0	0	0	188
cSH	263	318	1700	1700	1700	1700	1700
Volume to Capacity	0.34	0.12	0.29	0.29	0.56	0.56	0.11
Queue Length 95th (m)	11.2	3.1	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	25.7	17.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	D	C					
Approach Delay (s)	25.7	0.7			0.0		
Approach LOS	D						

Intersection Summary			
Average Delay		0.9	
Intersection Capacity Utilization	60.6%		ICU Level of Service B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	264	81	203	415	48	245	173	129	100	215	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1768	3542	1477	1731	3452		1742	3490	1675	1760	3386	
Flt Permitted	0.48	1.00	1.00	0.42	1.00		0.40	1.00	1.00	0.64	1.00	
Satd. Flow (perm)	892	3542	1477	770	3452		726	3490	1675	1185	3386	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	46	272	84	209	428	49	253	178	133	103	222	70
RTOR Reduction (vph)	0	0	68	0	6	0	0	0	94	0	26	0
Lane Group Flow (vph)	46	272	16	209	471	0	253	178	39	103	266	0
Confl. Peds. (#/hr)	6		13	13		6	11		6	6		11
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt		Perm	pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	19.9	15.7	15.7	33.7	23.5		35.8	22.8	22.8	21.3	14.3	
Effective Green, g (s)	19.9	15.7	15.7	33.7	23.5		35.8	22.8	22.8	21.3	14.3	
Actuated g/C Ratio	0.24	0.19	0.19	0.41	0.29		0.44	0.28	0.28	0.26	0.18	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	263	682	285	460	995		512	976	469	359	594	
v/s Ratio Prot	0.01	0.08		c0.07	c0.14		c0.09	0.05		0.02	0.08	
v/s Ratio Perm	0.03		0.01	0.12			c0.12		0.02	0.05		
v/c Ratio	0.17	0.40	0.06	0.45	0.47		0.49	0.18	0.08	0.29	0.45	
Uniform Delay, d1	23.9	28.8	26.9	16.2	23.9		15.3	22.3	21.6	23.6	30.1	
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	0.3	0.5	0.1	0.7	0.5		0.8	0.1	0.1	0.4	0.7	
Delay (s)	24.2	29.3	27.0	16.9	24.4		16.1	22.4	21.7	24.1	30.8	
Level of Service	C	C	C	B	C		B	C	C	C	C	
Approach Delay (s)		28.2			22.1			19.4			29.0	
Approach LOS		C			C			B			C	

Intersection Summary

HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	81.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	47	149	77	69	160	187	91	264	90	140	262	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.98		1.00	0.98		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.97	1.00		0.98	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.92		1.00	0.96		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)	1673	3228		1686	3359		1738	1808		1807	2017	
Flt Permitted	0.51	1.00		0.59	1.00		0.53	1.00		0.31	1.00	
Satd. Flow (perm)	898	3228		1040	3359		975	1808		586	2017	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	56	177	92	82	190	223	108	314	107	167	312	74
RTOR Reduction (vph)	0	72	0	0	174	0	0	15	0	0	10	0
Lane Group Flow (vph)	56	197	0	82	239	0	108	406	0	167	376	0
Confl. Peds. (#/hr)	28		30	30		28	38		44	44		38
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	2%
Turn Type	Perm		Perm		Perm		pm+pt					
Protected Phases		4			8			2		1		6
Permitted Phases	4			8		2				6		
Actuated Green, G (s)	12.2	12.2		12.2	12.2		19.7	19.7		31.4	31.4	
Effective Green, g (s)	12.2	12.2		12.2	12.2		19.7	19.7		31.4	31.4	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.35	0.35		0.56	0.56	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	197	708		228	737		345	641		478	1139	
v/s Ratio Prot		0.06			0.07			c0.22		0.04	c0.19	
v/s Ratio Perm	0.06			c0.08		0.11				0.16		
v/c Ratio	0.28	0.28		0.36	0.32		0.31	0.63		0.35	0.33	
Uniform Delay, d1	18.1	18.0		18.4	18.2		13.0	14.9		6.9	6.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.3		1.3	0.4		0.7	2.3		0.6	0.2	
Delay (s)	19.2	18.3		19.7	18.6		13.7	17.2		7.5	6.7	
Level of Service	B	B		B	B		B	B		A	A	
Approach Delay (s)		18.5			18.8			16.5			6.9	
Approach LOS		B			B			B			A	

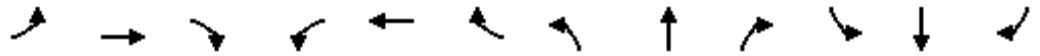
Intersection Summary

HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28

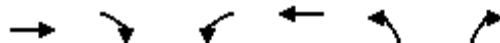


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	17	70	87	2	99	147	48	96	5	94	201	30
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	22	90	112	3	127	188	62	123	6	121	258	38
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	223	318	191	417								
Volume Left (vph)	22	3	62	121								
Volume Right (vph)	112	188	6	38								
Hadj (s)	-0.28	-0.35	0.07	0.01								
Departure Headway (s)	6.3	6.0	6.6	6.0								
Degree Utilization, x	0.39	0.53	0.35	0.70								
Capacity (veh/h)	499	551	475	568								
Control Delay (s)	13.2	15.5	13.1	21.8								
Approach Delay (s)	13.2	15.5	13.1	21.8								
Approach LOS	B	C	B	C								
Intersection Summary												
Delay			16.9									
HCM Level of Service			C									
Intersection Capacity Utilization			50.9%	ICU Level of Service			A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	488	93	354	481	0	164
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	588	112	427	580	0	198
Pedestrians	159			2	12	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	14			0	1	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked				1.00	1.00	1.00
vC, conflicting volume				600	1902	308
vC1, stage 1 conf vol					600	
vC2, stage 2 conf vol					1302	
vCu, unblocked vol				591	1898	298
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)				2.2	3.5	3.3
p0 queue free %				56	100	71
cM capacity (veh/h)				979	89	692

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1	
Volume Total	294	294	112	213	213	290	290	198	
Volume Left	0	0	0	213	213	0	0	0	
Volume Right	0	0	112	0	0	0	0	198	
cSH	1700	1700	1700	979	979	1700	1700	692	
Volume to Capacity	0.17	0.17	0.07	0.44	0.44	0.17	0.17	0.29	
Queue Length 95th (m)	0.0	0.0	0.0	17.0	17.0	0.0	0.0	8.9	
Control Delay (s)	0.0	0.0	0.0	11.5	11.5	0.0	0.0	12.3	
Lane LOS				B	B	B			
Approach Delay (s)	0.0			4.9			12.3		
Approach LOS							B		

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

9: Pine Centre Frontage Rd & Hwy 97 S Ramp

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop				Stop			Stop			Stop	
Volume (vph)	150	40	1	8	35	25	18	60	6	21	65	23
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	170	45	1	9	40	28	20	68	7	24	74	26
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total (vph)	170	45	1	9	68	95	124					
Volume Left (vph)	170	0	0	9	0	20	24					
Volume Right (vph)	0	0	1	0	28	7	26					
Hadj (s)	0.50	0.00	-0.70	0.50	-0.26	0.00	-0.07					
Departure Headway (s)	5.6	5.1	3.2	5.8	5.0	4.8	4.7					
Degree Utilization, x	0.27	0.06	0.00	0.01	0.10	0.13	0.16					
Capacity (veh/h)	610	670	1121	588	674	701	715					
Control Delay (s)	9.5	7.3	5.0	7.7	7.4	8.5	8.6					
Approach Delay (s)	9.0			7.4		8.5	8.6					
Approach LOS	A			A		A	A					
Intersection Summary												
Delay			8.6									
HCM Level of Service			A									
Intersection Capacity Utilization			29.4%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	51	228	153	265	263	6	142	14	21	66	10	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00	0.91		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1800	3543		1885	3754		1859	1790		1881	1732	
Flt Permitted	0.57	1.00		0.37	1.00		0.73	1.00		0.73	1.00	
Satd. Flow (perm)	1072	3543		737	3754		1419	1790		1447	1732	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	58	259	174	301	299	7	161	16	24	75	11	38
RTOR Reduction (vph)	0	126	0	0	2	0	0	20	0	0	31	0
Lane Group Flow (vph)	58	307	0	301	304	0	161	20	0	75	18	0
Confl. Peds. (#/hr)	14					14	7		4	4		7
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.5	14.4		30.5	21.4		9.6	9.6		9.6	9.6	
Effective Green, g (s)	18.5	14.4		30.5	21.4		9.6	9.6		9.6	9.6	
Actuated g/C Ratio	0.36	0.28		0.59	0.41		0.18	0.18		0.18	0.18	
Clearance Time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	438	979		676	1542		261	330		267	319	
v/s Ratio Prot	0.01	0.09		c0.09	0.08			0.01			0.01	
v/s Ratio Perm	0.04			c0.17			c0.11			0.05		
v/c Ratio	0.13	0.31		0.45	0.20		0.62	0.06		0.28	0.06	
Uniform Delay, d1	11.2	14.9		5.7	9.8		19.6	17.5		18.3	17.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		0.6	0.1		4.9	0.1		0.8	0.1	
Delay (s)	11.4	15.2		6.3	9.9		24.5	17.6		19.1	17.6	
Level of Service	B	B		A	A		C	B		B	B	
Approach Delay (s)		14.7			8.1			23.1			18.5	
Approach LOS		B			A			C			B	

Intersection Summary

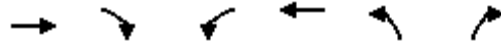
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	52.1	Sum of lost time (s)	11.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	87	73	44	136	114	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	79	48	148	124	11
Pedestrians					3	
Lane Width (m)					4.8	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			177			137
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			177			137
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			97			99
cM capacity (veh/h)			1377			914

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	174	196	135
Volume Left	0	48	124
Volume Right	79	0	11
cSH	1700	1377	619
Volume to Capacity	0.10	0.03	0.22
Queue Length 95th (m)	0.0	0.8	6.3
Control Delay (s)	0.0	2.1	12.4
Lane LOS	A		B
Approach Delay (s)	0.0	2.1	12.4
Approach LOS	B		

Intersection Summary			
Average Delay			4.1
Intersection Capacity Utilization	36.1%		ICU Level of Service
Analysis Period (min)	15		A

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑	↗	↙	↑↑	↗	↙↗	↑↑	↗	↙	↑↑	↗
Volume (vph)	71	387	810	112	400	59	522	373	27	73	442	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	7.0	5.5	7.0	7.0	7.6	6.6	6.6	7.0	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1726	3642	1821	1763	3573	1796	3467	3696	1523	1707	3599	1777
Flt Permitted	0.47	1.00	1.00	0.39	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	856	3642	1821	731	3573	1796	3467	3696	1523	1707	3599	1777
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	82	445	931	129	460	68	600	429	31	84	508	53
RTOR Reduction (vph)	0	0	356	0	0	45	0	0	24	0	0	43
Lane Group Flow (vph)	82	445	575	129	460	23	600	429	7	84	508	10
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	4%	3%	0%	3%	5%	0%	0%	1%	19%	3%	1%	0%
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8		2				6
Actuated Green, G (s)	42.2	35.3	35.3	48.8	38.6	38.6	18.1	24.0	24.0	16.9	22.2	22.2
Effective Green, g (s)	42.2	35.3	35.3	48.8	38.6	38.6	18.1	24.0	24.0	16.9	22.2	22.2
Actuated g/C Ratio	0.38	0.31	0.31	0.43	0.34	0.34	0.16	0.21	0.21	0.15	0.20	0.20
Clearance Time (s)	5.5	7.0	7.0	5.5	7.0	7.0	7.6	6.6	6.6	7.0	6.6	6.6
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	374	1143	571	411	1226	616	558	788	325	256	710	351
v/s Ratio Prot	0.01	0.12		c0.03	c0.13		c0.17	0.12		0.05	c0.14	
v/s Ratio Perm	0.07		c0.32	0.11		0.01			0.00			0.01
v/c Ratio	0.22	0.39	1.01	0.31	0.38	0.04	1.08	0.54	0.02	0.33	0.72	0.03
Uniform Delay, d1	23.1	30.2	38.6	19.8	27.9	24.6	47.2	39.4	35.0	42.7	42.2	36.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.5	39.3	0.4	0.4	0.1	59.9	0.8	0.0	0.8	3.4	0.0
Delay (s)	23.4	30.6	77.9	20.2	28.3	24.6	107.1	40.2	35.0	43.5	45.6	36.5
Level of Service	C	C	E	C	C	C	F	D	C	D	D	D
Approach Delay (s)		60.4			26.3			77.9			44.6	
Approach LOS		E			C			E			D	

Intersection Summary

HCM Average Control Delay	56.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	112.5	Sum of lost time (s)	33.7
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	25	29	14	1032	1286	43
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	27	31	15	1110	1383	46
Pedestrians				2	1	
Lane Width (m)				3.8	3.4	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1992	717	1429			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1992	717	1429			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	49	92	97			
cM capacity (veh/h)	53	377	482			
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	58	15	555	555	922	507
Volume Left	27	15	0	0	0	0
Volume Right	31	0	0	0	0	46
cSH	98	482	1700	1700	1700	1700
Volume to Capacity	0.59	0.03	0.33	0.33	0.54	0.30
Queue Length 95th (m)	21.3	0.7	0.0	0.0	0.0	0.0
Control Delay (s)	85.3	12.7	0.0	0.0	0.0	0.0
Lane LOS	F	B				
Approach Delay (s)	85.3	0.2			0.0	
Approach LOS	F					
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			47.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↖↖	↖	↖↗	↖↖	↖	↖	↖↖	↖	↖	↖↖	↖
Volume (vph)	123	171	118	263	176	34	208	779	213	39	871	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.8	6.3	5.8	5.8	5.9	6.0	6.0	5.7	6.0	6.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3733	1592	3390	3450	1615	1747	3693	1812	1725	3654	1806
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.14	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	3236	3733	1592	3390	3450	1615	252	3693	1812	501	3654	1806
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	138	192	133	296	198	38	234	875	239	44	979	228
RTOR Reduction (vph)	0	0	104	0	0	31	0	0	129	0	0	136
Lane Group Flow (vph)	138	192	29	296	198	7	234	875	110	44	979	92
Confl. Peds. (#/hr)			2	2			1					1
Heavy Vehicles (%)	1%	1%	0%	1%	0%	0%	1%	1%	1%	0%	1%	0%
Turn Type	Prot		Perm	Prot		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	8.5	10.4	10.4	13.7	15.7	15.7	53.8	44.0	44.0	41.9	37.8	37.8
Effective Green, g (s)	8.5	10.4	10.4	13.7	15.7	15.7	53.8	44.0	44.0	41.9	37.8	37.8
Actuated g/C Ratio	0.09	0.11	0.11	0.14	0.16	0.16	0.56	0.46	0.46	0.44	0.39	0.39
Clearance Time (s)	6.2	5.8	5.8	6.3	5.8	5.8	5.9	6.0	6.0	5.7	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	5.0	5.0
Lane Grp Cap (vph)	287	404	172	484	564	264	299	1693	831	271	1439	711
v/s Ratio Prot	0.04	c0.05		c0.09	0.06		c0.08	0.24		0.01	0.27	
v/s Ratio Perm			0.02			0.00	c0.36		0.06	0.06		0.05
v/c Ratio	0.48	0.48	0.17	0.61	0.35	0.03	0.78	0.52	0.13	0.16	0.68	0.13
Uniform Delay, d1	41.6	40.2	38.9	38.7	35.6	33.7	15.7	18.5	15.0	15.8	24.1	18.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	0.9	0.5	2.3	0.4	0.0	12.5	0.5	0.2	0.3	1.7	0.2
Delay (s)	42.9	41.1	39.3	40.9	36.0	33.8	28.2	19.0	15.1	16.1	25.8	18.8
Level of Service	D	D	D	D	D	C	C	B	B	B	C	B
Approach Delay (s)		41.1			38.6			19.9			24.2	
Approach LOS		D			D			B			C	

Intersection Summary

HCM Average Control Delay	26.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	96.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↗
Volume (veh/h)	0	76	39	979	908	243
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	84	43	1088	1009	270
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1639	504	1009			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1639	504	1009			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	84	94			
cM capacity (veh/h)	87	515	677			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	84	43	544	544	504	504	270
Volume Left	0	43	0	0	0	0	0
Volume Right	84	0	0	0	0	0	270
cSH	515	677	1700	1700	1700	1700	1700
Volume to Capacity	0.16	0.06	0.32	0.32	0.30	0.30	0.16
Queue Length 95th (m)	4.4	1.6	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	13.3	10.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B					
Approach Delay (s)	13.3	0.4			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization	36.5%		ICU Level of Service A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	307	55	76	180	23	274	179	149	166	282	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1761	3507	1466	1732	3411		1744	3455	1723	1747	3432	
Flt Permitted	0.58	1.00	1.00	0.40	1.00		0.28	1.00	1.00	0.60	1.00	
Satd. Flow (perm)	1076	3507	1466	726	3411		519	3455	1723	1103	3432	
Peak-hour factor, PHF	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Adj. Flow (vph)	77	421	75	104	247	32	375	245	204	227	386	78
RTOR Reduction (vph)	0	0	59	0	10	0	0	0	118	0	16	0
Lane Group Flow (vph)	77	421	16	104	269	0	375	245	86	227	448	0
Confl. Peds. (#/hr)	14		11	11		14	5					5
Heavy Vehicles (%)	0%	1%	2%	0%	1%	0%	0%	1%	0%	1%	0%	0%
Turn Type	pm+pt		Perm	pm+pt			pm+pt		Perm	pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	23.3	17.0	17.0	24.9	17.8		38.7	23.2	23.2	27.3	17.5	
Effective Green, g (s)	23.3	17.0	17.0	24.9	17.8		38.7	23.2	23.2	27.3	17.5	
Actuated g/C Ratio	0.29	0.21	0.21	0.31	0.22		0.48	0.29	0.29	0.34	0.22	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	4.0	3.0	4.0		3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)	362	735	307	311	749		482	988	493	449	741	
v/s Ratio Prot	0.02	c0.12		c0.03	0.08		c0.15	0.07		0.06	0.13	
v/s Ratio Perm	0.04		0.01	0.07			c0.22		0.05	0.11		
v/c Ratio	0.21	0.57	0.05	0.33	0.36		0.78	0.25	0.17	0.51	0.61	
Uniform Delay, d1	21.5	28.8	25.6	20.8	26.8		15.1	22.2	21.8	20.5	28.7	
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	0.3	1.3	0.1	0.6	0.4		7.7	0.2	0.2	0.9	1.6	
Delay (s)	21.8	30.1	25.7	21.5	27.2		22.9	22.4	22.0	21.4	30.3	
Level of Service	C	C	C	C	C		C	C	C	C	C	
Approach Delay (s)		28.4			25.7			22.5			27.4	
Approach LOS		C			C			C			C	

Intersection Summary

HCM Average Control Delay	25.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	81.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	41	132	9	59	147	276	16	331	128	194	238	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.90		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	3468		1734	3351		1762	1812		1813	2064	
Flt Permitted	0.48	1.00		0.66	1.00		0.59	1.00		0.26	1.00	
Satd. Flow (perm)	881	3468		1206	3351		1098	1812		493	2064	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	42	135	9	60	150	282	16	338	131	198	243	29
RTOR Reduction (vph)	0	7	0	0	229	0	0	21	0	0	6	0
Lane Group Flow (vph)	42	137	0	60	203	0	16	448	0	198	266	0
Confl. Peds. (#/hr)	6		5	5		6	4		6	6		4
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm		Perm		Perm		pm+pt					
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		2				6		
Actuated Green, G (s)	10.1	10.1		10.1	10.1		18.8	18.8		31.8	31.8	
Effective Green, g (s)	10.1	10.1		10.1	10.1		18.8	18.8		31.8	31.8	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.35	0.35		0.59	0.59	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	165	650		226	628		383	632		487	1218	
v/s Ratio Prot		0.04			c0.06			c0.25		c0.06	0.13	
v/s Ratio Perm	0.05			0.05		0.01				0.18		
v/c Ratio	0.25	0.21		0.27	0.32		0.04	0.71		0.41	0.22	
Uniform Delay, d1	18.7	18.5		18.7	18.9		11.6	15.2		6.6	5.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.2		0.9	0.4		0.1	3.9		0.8	0.1	
Delay (s)	19.8	18.7		19.6	19.4		11.7	19.1		7.4	5.3	
Level of Service	B	B		B	B		B	B		A	A	
Approach Delay (s)		19.0			19.4			18.8			6.2	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	53.9	Sum of lost time (s)	17.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28

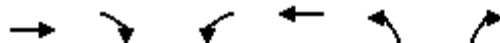


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	25	109	63	2	92	339	76	155	2	130	125	7
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	27	117	68	2	99	365	82	167	2	140	134	8
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	212	466	251	282								
Volume Left (vph)	27	2	82	140								
Volume Right (vph)	68	365	2	8								
Hadj (s)	-0.17	-0.47	0.06	0.08								
Departure Headway (s)	6.6	5.7	6.8	6.7								
Degree Utilization, x	0.39	0.74	0.47	0.53								
Capacity (veh/h)	469	588	461	480								
Control Delay (s)	13.7	23.5	15.7	16.9								
Approach Delay (s)	13.7	23.5	15.7	16.9								
Approach LOS	B	C	C	C								
Intersection Summary												
Delay			18.6									
HCM Level of Service			C									
Intersection Capacity Utilization			58.6%	ICU Level of Service	B							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↓	↑↑		↑
Volume (veh/h)	505	140	460	336	0	246
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	549	152	500	365	0	267
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised		Raised			
Median storage veh	1		1			
Upstream signal (m)	207					
pX, platoon unblocked						
vC, conflicting volume			549		1732	274
vC1, stage 1 conf vol					549	
vC2, stage 2 conf vol					1183	
vCu, unblocked vol			549		1732	274
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			51		100	63
cM capacity (veh/h)			1031		109	729





















Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1	
Volume Total	274	274	152	250	250	183	183	267	
Volume Left	0	0	0	250	250	0	0	0	
Volume Right	0	0	152	0	0	0	0	267	
cSH	1700	1700	1700	1031	1031	1700	1700	729	
Volume to Capacity	0.16	0.16	0.09	0.49	0.49	0.11	0.11	0.37	
Queue Length 95th (m)	0.0	0.0	0.0	20.6	20.6	0.0	0.0	12.8	
Control Delay (s)	0.0	0.0	0.0	11.7	11.7	0.0	0.0	12.8	
Lane LOS				B	B	B			
Approach Delay (s)	0.0			6.8			12.8		
Approach LOS							B		

Intersection Summary

Average Delay	5.1	
Intersection Capacity Utilization	35.9%	ICU Level of Service A
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis
 9: Pine Centre Frontage Rd & Hwy 97 S Ramp

2008/10/28

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop				Stop			Stop			Stop	
Volume (vph)	245	62	11	20	46	27	29	108	16	41	110	24
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	269	68	12	22	51	30	32	119	18	45	121	26
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	SB 1					
Volume Total (vph)	269	68	12	22	80	168	192					
Volume Left (vph)	269	0	0	22	0	32	45					
Volume Right (vph)	0	0	12	0	30	18	26					
Hadj (s)	0.50	0.00	-0.70	0.50	-0.26	-0.02	-0.04					
Departure Headway (s)	6.2	5.7	3.2	6.5	5.8	5.4	5.4					
Degree Utilization, x	0.46	0.11	0.01	0.04	0.13	0.25	0.29					
Capacity (veh/h)	559	606	1121	508	572	618	624					
Control Delay (s)	13.1	8.1	5.0	8.6	8.4	10.2	10.5					
Approach Delay (s)	11.9			8.4		10.2	10.5					
Approach LOS	B			A		B						
Intersection Summary												
Delay			10.8									
HCM Level of Service			B									
Intersection Capacity Utilization			40.7%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	81	218	200	337	279	22	175	19	23	80	17	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.99		1.00	0.92		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1885	3431		1883	3729		1884	1810		1884	1709	
Flt Permitted	0.52	1.00		0.29	1.00		0.66	1.00		0.72	1.00	
Satd. Flow (perm)	1029	3431		575	3729		1299	1810		1430	1709	
Peak-hour factor, PHF	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Adj. Flow (vph)	107	287	263	443	367	29	230	25	30	105	22	139
RTOR Reduction (vph)	0	201	0	0	8	0	0	22	0	0	100	0
Lane Group Flow (vph)	107	349	0	443	388	0	230	33	0	105	61	0
Confl. Peds. (#/hr)			7	7			1		1	1		1
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.0	13.4		27.4	17.1		16.0	16.0		16.0	16.0	
Effective Green, g (s)	20.0	13.4		27.4	17.1		16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.35	0.24		0.48	0.30		0.28	0.28		0.28	0.28	
Clearance Time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	463	811		515	1125		367	511		404	482	
v/s Ratio Prot	0.03	0.10		c0.16	0.10			0.02			0.04	
v/s Ratio Perm	0.05			c0.26			c0.18			0.07		
v/c Ratio	0.23	0.43		0.86	0.35		0.63	0.07		0.26	0.13	
Uniform Delay, d1	12.6	18.4		10.5	15.4		17.7	14.9		15.8	15.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.5		14.1	0.3		3.8	0.1		0.5	0.2	
Delay (s)	12.9	18.9		24.7	15.7		21.5	15.0		16.2	15.3	
Level of Service	B	B		C	B		C	B		B	B	
Approach Delay (s)		17.9			20.4			20.2			15.7	
Approach LOS		B			C			C			B	

Intersection Summary

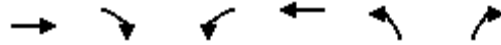
HCM Average Control Delay	19.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	56.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



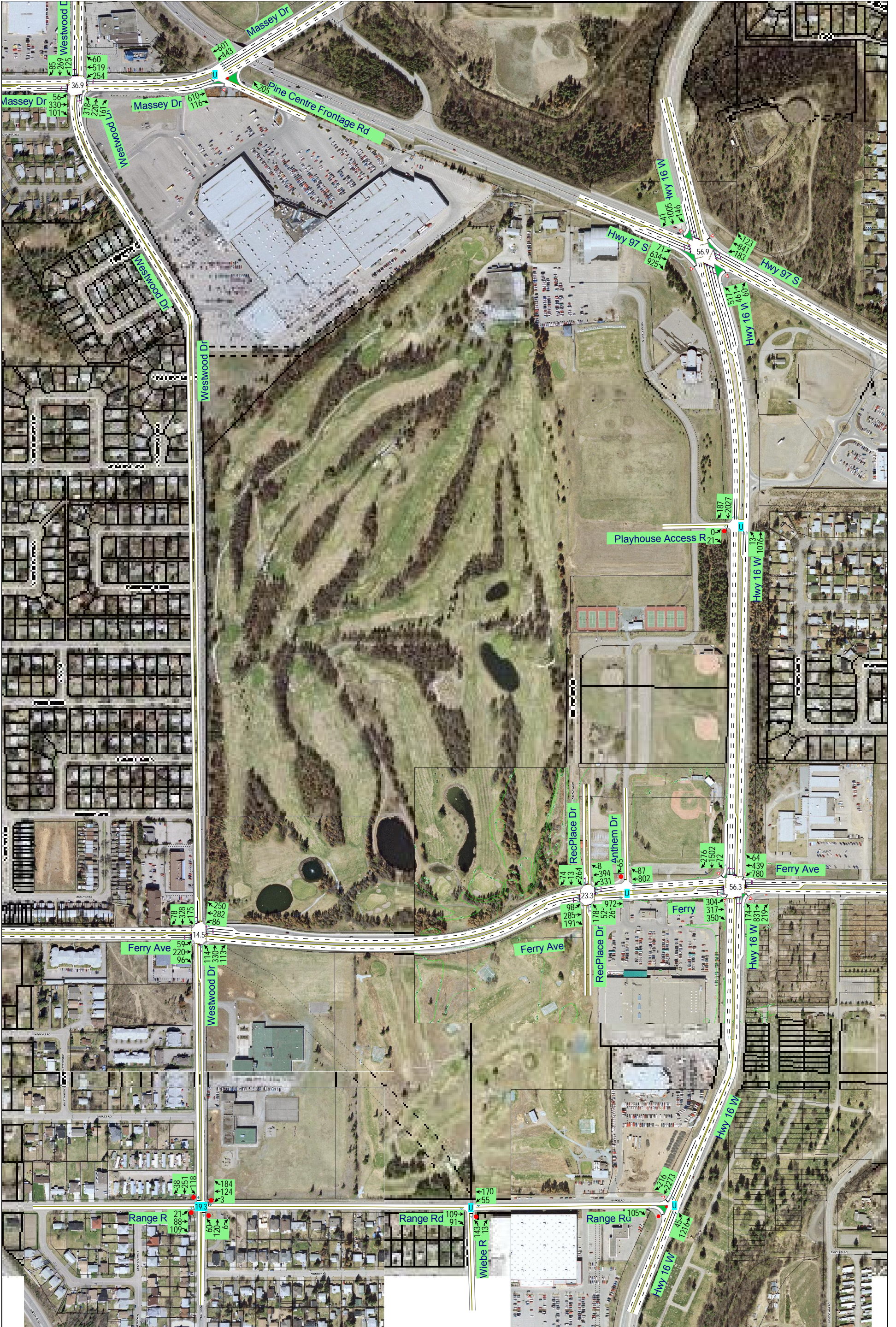
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	↘	↙
Volume (veh/h)	107	149	22	207	249	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	127	177	26	246	296	30
Pedestrians						8
Lane Width (m)						4.8
Walking Speed (m/s)						1.2
Percent Blockage						1
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			313			224
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			313			224
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			98			96
cM capacity (veh/h)			1248			813

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	305	273	326
Volume Left	0	26	296
Volume Right	177	0	30
cSH	1700	1248	521
Volume to Capacity	0.18	0.02	0.63
Queue Length 95th (m)	0.0	0.5	32.5
Control Delay (s)	0.0	0.9	22.8
Lane LOS	A		C
Approach Delay (s)	0.0	0.9	22.8
Approach LOS	C		

Intersection Summary			
Average Delay			8.5
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)			15

2023 Future Background Conditions





HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	688	410	79	578	95	590	574	88	115	245	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1694	3539	1686	1713	3506	1735	3366	3624	1645	1724	3564	1671
Flt Permitted	0.35	1.00	1.00	0.17	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	624	3539	1686	304	3506	1735	3366	3624	1645	1724	3564	1671
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	23	782	466	90	657	108	670	652	100	131	278	26
RTOR Reduction (vph)	0	0	0	0	0	55	0	0	69	0	0	20
Lane Group Flow (vph)	23	782	466	90	657	53	670	652	31	131	278	6
Confl. Peds. (#/hr)	1					1	9		2	2		9
Heavy Vehicles (%)	6%	6%	8%	6%	7%	4%	3%	3%	9%	2%	2%	6%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	36.2	32.4	105.5	46.2	37.4	51.6	18.4	24.0	32.8	14.2	19.2	23.0
Effective Green, g (s)	36.2	32.4	105.5	46.2	37.4	51.6	18.4	24.0	32.8	14.2	19.2	23.0
Actuated g/C Ratio	0.34	0.31	1.00	0.44	0.35	0.49	0.17	0.23	0.31	0.13	0.18	0.22
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	253	1087	1686	251	1243	849	587	824	511	232	649	364
v/s Ratio Prot	0.00	c0.22		0.03	0.19	0.01	c0.20	0.18	0.01	c0.08	0.08	0.00
v/s Ratio Perm	0.03		c0.28	0.13		0.02			0.01			0.00
v/c Ratio	0.09	0.72	0.28	0.36	0.53	0.06	1.14	0.79	0.06	0.56	0.43	0.02
Uniform Delay, d1	23.2	32.5	0.0	19.7	27.0	14.2	43.6	38.4	25.5	42.8	38.3	32.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	2.9	0.4	0.9	0.8	0.0	82.7	5.2	0.1	3.1	0.5	0.0
Delay (s)	23.3	35.4	0.4	20.6	27.8	14.2	126.2	43.6	25.6	45.9	38.7	32.4
Level of Service	C	D	A	C	C	B	F	D	C	D	D	C
Approach Delay (s)		22.3			25.3			81.3			40.5	
Approach LOS		C			C			F			D	

Intersection Summary

HCM Average Control Delay	46.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	105.5	Sum of lost time (s)	21.6
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	11	5	1585	628	114
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	13	6	1887	748	136
Pedestrians					3	
Lane Width (m)					3.4	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1774	317	883			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1774	317	883			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	99			
cM capacity (veh/h)	75	685	774			

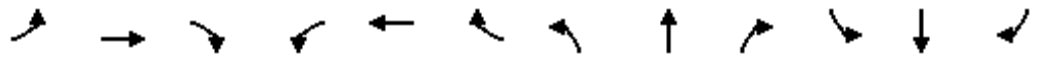
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	13	6	943	943	299	299	285
Volume Left	0	6	0	0	0	0	0
Volume Right	13	0	0	0	0	0	136
cSH	685	774	1700	1700	1700	1700	1700
Volume to Capacity	0.02	0.01	0.55	0.55	0.18	0.18	0.17
Queue Length 95th (m)	0.4	0.2	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	10.4	9.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	10.4	0.0			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization	53.8%		ICU Level of Service A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↕	↖	↖↗	↕	↖	↖	↕	↖	↖	↕↖↗	↖
Volume (vph)	121	250	93	396	225	79	164	1544	690	63	430	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	6.2
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3697	1583	3292	3450	1568	1764	3622	1830	1675	5148	1809
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.44	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	3236	3697	1583	3292	3450	1568	814	3622	1830	136	5148	1809
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	272	101	430	245	86	178	1678	750	68	467	50
RTOR Reduction (vph)	0	0	51	0	0	19	0	0	80	0	0	24
Lane Group Flow (vph)	132	272	50	430	245	67	178	1678	670	68	467	26
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	2%	2%	4%	0%	3%	0%	3%	0%	3%	3%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	9.2	13.8	23.1	16.8	21.5	27.5	64.8	55.5	72.3	58.0	52.0	61.2
Effective Green, g (s)	9.2	13.8	23.1	16.8	21.5	27.5	64.8	55.5	72.3	58.0	52.0	61.2
Actuated g/C Ratio	0.08	0.12	0.20	0.14	0.19	0.24	0.56	0.48	0.62	0.50	0.45	0.53
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	6.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	3.0
Lane Grp Cap (vph)	257	440	316	477	640	372	531	1734	1142	148	2310	955
v/s Ratio Prot	0.04	c0.07	0.01	c0.13	c0.07	0.01	c0.03	c0.46	0.09	0.02	0.09	0.00
v/s Ratio Perm			0.02			0.03	0.16		0.28	0.21		0.01
v/c Ratio	0.51	0.62	0.16	0.90	0.38	0.18	0.34	0.97	0.59	0.46	0.20	0.03
Uniform Delay, d1	51.2	48.5	38.4	48.7	41.4	35.2	12.6	29.3	12.9	25.4	19.4	13.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	2.6	0.2	20.0	0.4	0.2	0.4	14.8	0.8	2.3	0.1	0.0
Delay (s)	52.9	51.1	38.6	68.7	41.8	35.4	13.0	44.1	13.7	27.7	19.5	13.1
Level of Service	D	D	D	E	D	D	B	D	B	C	B	B
Approach Delay (s)		49.1			56.3			33.2			19.9	
Approach LOS		D			E			C			B	

Intersection Summary		
HCM Average Control Delay	37.2	HCM Level of Service D
HCM Volume to Capacity ratio	0.94	
Actuated Cycle Length (s)	115.9	Sum of lost time (s) 29.8
Intersection Capacity Utilization	85.3%	ICU Level of Service E
Analysis Period (min)	15	

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↗
Volume (veh/h)	0	49	83	2134	814	49
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	52	88	2270	866	52
Pedestrians				1		
Lane Width (m)				3.7		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2178	434	866			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2178	434	866			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	91	89			
cM capacity (veh/h)	36	575	773			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	52	88	1135	1135	433	433	52
Volume Left	0	88	0	0	0	0	0
Volume Right	52	0	0	0	0	0	52
cSH	575	773	1700	1700	1700	1700	1700
Volume to Capacity	0.09	0.11	0.67	0.67	0.25	0.25	0.03
Queue Length 95th (m)	2.3	2.9	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	11.9	10.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B					
Approach Delay (s)	11.9	0.4			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization	69.3%		ICU Level of Service C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	464	76	65	268	11	166	125	221	123	155	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3542	1477	1734	3489		1726	3421	1704	1761	3301	
Flt Permitted	0.57	1.00	1.00	0.35	1.00		0.54	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	986	3542	1477	631	3489		985	3421	1704	1234	3301	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	504	83	71	291	12	180	136	240	134	168	68
RTOR Reduction (vph)	0	0	52	0	3	0	0	0	141	0	54	0
Lane Group Flow (vph)	37	504	31	71	300	0	180	136	99	134	182	0
Confl. Peds. (#/hr)	7		10	10		7	5		5	5		5
Heavy Vehicles (%)	7%	0%	2%	0%	0%	0%	1%	2%	0%	0%	1%	4%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	21.4	19.2	25.2	29.0	23.0		18.6	12.6	18.6	16.0	11.3	
Effective Green, g (s)	21.4	19.2	25.2	29.0	23.0		18.6	12.6	18.6	16.0	11.3	
Actuated g/C Ratio	0.32	0.29	0.38	0.44	0.35		0.28	0.19	0.28	0.24	0.17	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	339	1023	693	375	1207		342	648	630	334	561	
v/s Ratio Prot	0.00	c0.14	0.00	0.02	c0.09		c0.05	0.04	c0.01	0.03	0.06	
v/s Ratio Perm	0.03		0.02	0.07			c0.10		0.04	0.07		
v/c Ratio	0.11	0.49	0.05	0.19	0.25		0.53	0.21	0.16	0.40	0.32	
Uniform Delay, d1	15.6	19.6	13.0	11.3	15.6		19.3	22.7	18.0	20.8	24.2	
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	0.1	0.5	0.0	0.2	0.1		1.5	0.2	0.1	0.8	0.5	
Delay (s)	15.8	20.1	13.1	11.6	15.7		20.7	23.0	18.2	21.5	24.7	
Level of Service	B	C	B	B	B		C	C	B	C	C	
Approach Delay (s)		18.9			14.9			20.2			23.6	
Approach LOS		B			B			C			C	

Intersection Summary

HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	66.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	35	200	81	66	145	174	55	291	90	90	151	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.97	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		0.98	1.00	1.00	0.98	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	0.96		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1702	3294		1718	3697	1746	1738	1791		1759	2082	
Flt Permitted	0.65	1.00		0.56	1.00	1.00	0.64	1.00		0.29	1.00	
Satd. Flow (perm)	1158	3294		1006	3697	1746	1175	1791		539	2082	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	40	230	93	76	167	200	63	334	103	103	174	9
RTOR Reduction (vph)	0	72	0	0	0	135	0	18	0	0	3	0
Lane Group Flow (vph)	40	251	0	76	167	65	63	419	0	103	180	0
Confl. Peds. (#/hr)	15		16	16		15	30		20	20		30
Heavy Vehicles (%)	0%	0%	2%	0%	2%	2%	0%	2%	1%	3%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	10.7	10.7		10.7	10.7	16.8	18.0	18.0		29.1	29.1	
Effective Green, g (s)	10.7	10.7		10.7	10.7	16.8	18.0	18.0		29.1	29.1	
Actuated g/C Ratio	0.21	0.21		0.21	0.21	0.32	0.35	0.35		0.56	0.56	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	239	680		208	764	566	408	622		446	1170	
v/s Ratio Prot		c0.08			0.05	0.01		c0.23		c0.03	0.09	
v/s Ratio Perm	0.03			0.08		0.02	0.05			0.10		
v/c Ratio	0.17	0.37		0.37	0.22	0.11	0.15	0.67		0.23	0.15	
Uniform Delay, d1	16.9	17.6		17.6	17.1	12.3	11.7	14.4		6.3	5.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.5		1.5	0.2	0.1	0.2	3.1		0.4	0.1	
Delay (s)	17.3	18.1		19.1	17.3	12.4	11.9	17.5		6.7	5.5	
Level of Service	B	B		B	B	B	B	B		A	A	
Approach Delay (s)		18.0			15.4			16.8			5.9	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	51.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	73	49	41	1	31	89	40	131	1	33	63	16
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	84	56	47	1	36	102	46	151	1	38	72	18

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	187	139	198	129
Volume Left (vph)	84	1	46	38
Volume Right (vph)	47	102	1	18
Hadj (s)	-0.05	-0.39	0.05	-0.01
Departure Headway (s)	4.9	4.6	4.9	5.0
Degree Utilization, x	0.25	0.18	0.27	0.18
Capacity (veh/h)	685	713	683	663
Control Delay (s)	9.5	8.6	9.8	9.0
Approach Delay (s)	9.5	8.6	9.8	9.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay		9.3	
HCM Level of Service		A	
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	648	71	110	300	0	34
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	800	88	136	370	0	42
Pedestrians	90			5	5	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	8			0	0	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			805		1352	410
vC1, stage 1 conf vol					805	
vC2, stage 2 conf vol					547	
vCu, unblocked vol			639		1227	214
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			85		100	94
cM capacity (veh/h)			877		259	735

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	400	400	88	68	68	185	185	42
Volume Left	0	0	0	68	68	0	0	0
Volume Right	0	0	88	0	0	0	0	42
cSH	1700	1700	1700	877	877	1700	1700	735
Volume to Capacity	0.24	0.24	0.05	0.15	0.15	0.11	0.11	0.06
Queue Length 95th (m)	0.0	0.0	0.0	4.2	4.2	0.0	0.0	1.4
Control Delay (s)	0.0	0.0	0.0	9.9	9.9	0.0	0.0	10.2
Lane LOS				A	A	B		
Approach Delay (s)	0.0			2.6			10.2	
Approach LOS							B	

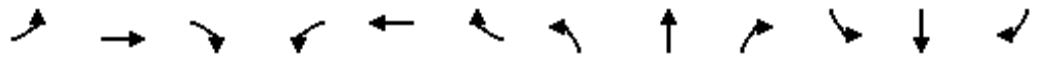
Intersection Summary

Average Delay	1.2	
Intersection Capacity Utilization	36.1%	ICU Level of Service A
Analysis Period (min)	15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	59	323	70	96	306	4	29	22	3	115	1	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.98		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1882	3622		1864	3725		1884	1830		1883	1674	
Flt Permitted	0.52	1.00		0.44	1.00		0.73	1.00		0.74	1.00	
Satd. Flow (perm)	1036	3622		865	3725		1451	1830		1460	1674	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	74	404	88	120	382	5	36	28	4	144	1	38
RTOR Reduction (vph)	0	23	0	0	1	0	0	3	0	0	31	0
Lane Group Flow (vph)	74	469	0	120	386	0	36	29	0	144	8	0
Confl. Peds. (#/hr)	5		5	5		5	1		2	2		1
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	0%	50%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	21.4	18.2		24.0	19.5		8.9	8.9		8.9	8.9	
Effective Green, g (s)	21.4	18.2		24.0	19.5		8.9	8.9		8.9	8.9	
Actuated g/C Ratio	0.44	0.37		0.49	0.40		0.18	0.18		0.18	0.18	
Clearance Time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	512	1356		520	1495		266	335		267	307	
v/s Ratio Prot	0.01	c0.13		c0.02	0.10			0.02			0.00	
v/s Ratio Perm	0.05			0.09			0.02			c0.10		
v/c Ratio	0.14	0.35		0.23	0.26		0.14	0.09		0.54	0.03	
Uniform Delay, d1	7.9	10.9		6.7	9.7		16.6	16.5		18.0	16.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.3	0.1		0.3	0.2		2.7	0.0	
Delay (s)	8.1	11.1		7.0	9.8		16.9	16.6		20.7	16.3	
Level of Service	A	B		A	A		B	B		C	B	
Approach Delay (s)		10.7			9.2			16.8			19.7	
Approach LOS		B			A			B			B	

Intersection Summary

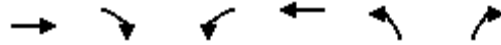
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	48.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	61	26	26	113	21	6
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	74	32	32	138	26	7
Pedestrians	2			4		
Lane Width (m)	4.3			4.8		
Walking Speed (m/s)	1.2			1.2		
Percent Blockage	0			0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			110			94
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			110			94
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			98			99
cM capacity (veh/h)			1486			964

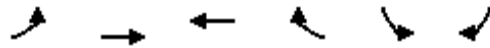
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	106	170	33
Volume Left	0	32	26
Volume Right	32	0	7
cSH	1700	1486	726
Volume to Capacity	0.06	0.02	0.05
Queue Length 95th (m)	0.0	0.5	1.1
Control Delay (s)	0.0	1.5	10.2
Lane LOS		A	B
Approach Delay (s)	0.0	1.5	10.2
Approach LOS			B

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization	24.1%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑			↑
Volume (veh/h)	0	465	382	53	0	32
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	505	415	58	0	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		59	163			
pX, platoon unblocked					0.94	
vC, conflicting volume	473				697	167
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	473				555	167
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	96
cM capacity (veh/h)	1085				435	848
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	253	253	166	166	141	35
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	58	35
cSH	1700	1700	1700	1700	1700	848
Volume to Capacity	0.15	0.15	0.10	0.10	0.08	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	1.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	9.4
Lane LOS						A
Approach Delay (s)	0.0		0.0			9.4
Approach LOS						A
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			18.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	634	925	183	841	123	517	461	60	146	1005	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	4.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1796	3506	1785	1780	3573	1781	3399	3660	1498	1741	3635	1766
Flt Permitted	0.12	1.00	1.00	0.16	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	224	3506	1785	303	3573	1781	3399	3660	1498	1741	3635	1766
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	689	1005	199	914	134	562	501	65	159	1092	45
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	49	0	0	7
Lane Group Flow (vph)	77	689	1005	199	914	134	562	501	16	159	1092	38
Confl. Peds. (#/hr)	1					1	9					9
Heavy Vehicles (%)	0%	7%	2%	2%	5%	1%	2%	2%	21%	1%	0%	0%
Turn Type	pm+pt		Free	pm+pt		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases	4		Free	8		Free			2			6
Actuated Green, G (s)	39.7	33.7	134.1	46.3	37.0	134.1	22.4	23.9	33.2	41.1	42.0	48.0
Effective Green, g (s)	39.7	33.7	134.1	46.3	37.0	134.1	22.4	23.9	33.2	41.1	42.0	48.0
Actuated g/C Ratio	0.30	0.25	1.00	0.35	0.28	1.00	0.17	0.18	0.25	0.31	0.31	0.36
Clearance Time (s)	5.5	7.0		5.5	7.0		7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	137	881	1785	207	986	1781	568	652	371	534	1138	632
v/s Ratio Prot	0.03	0.20		c0.07	0.26		c0.17	0.14	0.00	0.09	c0.30	0.00
v/s Ratio Perm	0.14		c0.56	c0.26		0.08			0.01			0.02
v/c Ratio	0.56	0.78	0.56	0.96	0.93	0.08	0.99	0.77	0.04	0.30	0.96	0.06
Uniform Delay, d1	37.3	46.8	0.0	38.0	47.2	0.0	55.7	52.5	38.4	35.5	45.2	28.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.2	5.3	1.3	51.3	14.7	0.1	34.7	5.4	0.0	0.3	17.6	0.0
Delay (s)	42.5	52.1	1.3	89.3	62.0	0.1	90.4	57.9	38.4	35.8	62.8	28.3
Level of Service	D	D	A	F	E	A	F	E	D	D	E	C
Approach Delay (s)		22.8			59.7			73.0			58.3	
Approach LOS		C			E			E			E	

Intersection Summary

HCM Average Control Delay	50.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	134.1	Sum of lost time (s)	13.1
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	21	13	1076	2027	187
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	23	14	1170	2203	203
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2918	836	2407			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2918	836	2407			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	93			
cM capacity (veh/h)	12	315	202			

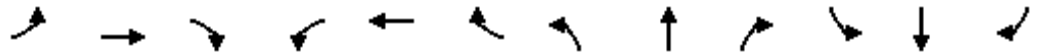
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	23	14	585	585	881	881	644
Volume Left	0	14	0	0	0	0	0
Volume Right	23	0	0	0	0	0	203
cSH	315	202	1700	1700	1700	1700	1700
Volume to Capacity	0.07	0.07	0.34	0.34	0.52	0.52	0.38
Queue Length 95th (m)	1.8	1.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	17.3	24.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	C					
Approach Delay (s)	17.3	0.3			0.0		
Approach LOS	C						

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization	53.3%		ICU Level of Service A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	304	317	350	780	439	64	174	831	219	72	1502	276
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	6.2
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3770	1596	3390	3450	1593	1765	3622	1812	1725	5250	1830
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.08	1.00	1.00	0.19	1.00	1.00
Satd. Flow (perm)	3236	3770	1596	3390	3450	1593	154	3622	1812	337	5250	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	330	345	380	848	477	70	189	903	238	78	1633	300
RTOR Reduction (vph)	0	0	3	0	0	17	0	0	63	0	0	54
Lane Group Flow (vph)	330	345	377	848	477	53	189	903	175	78	1633	246
Confl. Peds. (#/hr)	3		5	5		3						
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	3%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	18.1	17.0	29.4	33.1	32.1	39.2	60.6	48.2	81.3	49.8	42.7	60.8
Effective Green, g (s)	18.1	17.0	29.4	33.1	32.1	39.2	60.6	48.2	81.3	49.8	42.7	60.8
Actuated g/C Ratio	0.14	0.13	0.23	0.26	0.25	0.30	0.47	0.37	0.63	0.39	0.33	0.47
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	6.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	3.0
Lane Grp Cap (vph)	453	496	363	868	857	483	227	1351	1140	206	1735	861
v/s Ratio Prot	0.10	0.09	c0.10	c0.25	0.14	0.01	0.08	c0.25	0.04	0.02	c0.31	0.04
v/s Ratio Perm			0.14			0.03	0.31		0.06	0.12		0.09
v/c Ratio	0.73	0.70	1.04	0.98	0.56	0.11	0.83	0.67	0.15	0.38	0.94	0.29
Uniform Delay, d1	53.2	53.6	49.9	47.7	42.3	32.4	33.8	33.8	9.8	26.9	42.0	20.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.8	4.2	57.5	24.7	0.8	0.1	22.2	1.7	0.1	1.2	11.0	0.2
Delay (s)	59.0	57.8	107.4	72.4	43.1	32.5	56.0	35.5	9.9	28.1	53.1	21.1
Level of Service	E	E	F	E	D	C	E	D	A	C	D	C
Approach Delay (s)		76.1			60.4			33.8			47.3	
Approach LOS		E			E			C			D	

Intersection Summary		
HCM Average Control Delay	52.6	HCM Level of Service D
HCM Volume to Capacity ratio	0.98	
Actuated Cycle Length (s)	129.2	Sum of lost time (s) 23.8
Intersection Capacity Utilization	90.9%	ICU Level of Service E
Analysis Period (min)	15	

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↓↓	↘
Volume (veh/h)	0	105	45	1216	2273	216
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.92
Hourly flow rate (vph)	0	113	48	1308	2444	235
Pedestrians	1					
Lane Width (m)	4.8					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	3196	1223	2445			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3196	1223	2445			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	34	75			
cM capacity (veh/h)	6	172	194			

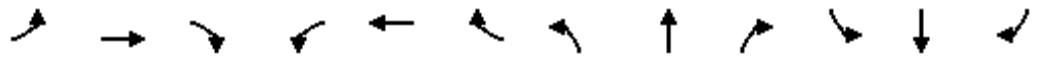
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	113	48	654	654	1222	1222	235
Volume Left	0	48	0	0	0	0	0
Volume Right	113	0	0	0	0	0	235
cSH	172	194	1700	1700	1700	1700	1700
Volume to Capacity	0.66	0.25	0.38	0.38	0.72	0.72	0.14
Queue Length 95th (m)	28.7	7.2	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	58.7	29.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	58.7	1.1			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	330	101	254	519	60	318	220	161	125	269	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3542	1489	1731	3451		1742	3490	1684	1761	3386	
Flt Permitted	0.39	1.00	1.00	0.48	1.00		0.44	1.00	1.00	0.61	1.00	
Satd. Flow (perm)	729	3542	1489	872	3451		798	3490	1684	1131	3386	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	58	340	104	262	535	62	328	227	166	129	277	88
RTOR Reduction (vph)	0	0	65	0	9	0	0	0	112	0	36	0
Lane Group Flow (vph)	58	340	39	262	588	0	328	227	54	129	329	0
Confl. Peds. (#/hr)	6		13	13		6	11		6	6		11
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	22.9	19.6	26.7	28.5	22.4		24.3	17.2	23.3	19.5	14.8	
Effective Green, g (s)	22.9	19.6	26.7	28.5	22.4		24.3	17.2	23.3	19.5	14.8	
Actuated g/C Ratio	0.32	0.27	0.37	0.40	0.31		0.34	0.24	0.33	0.27	0.21	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	281	970	680	420	1080		364	838	689	349	700	
v/s Ratio Prot	0.01	0.10	0.01	c0.05	0.17		c0.09	0.07	0.01	0.02	0.10	
v/s Ratio Perm	0.06		0.02	c0.19			c0.22		0.03	0.08		
v/c Ratio	0.21	0.35	0.06	0.62	0.54		0.90	0.27	0.08	0.37	0.47	
Uniform Delay, d1	17.1	20.9	14.4	15.9	20.4		21.0	22.1	16.7	20.5	25.0	
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	0.4	0.3	0.0	2.9	0.7		24.4	0.2	0.0	0.7	0.7	
Delay (s)	17.5	21.2	14.4	18.8	21.1		45.4	22.3	16.8	21.1	25.6	
Level of Service	B	C	B	B	C		D	C	B	C	C	
Approach Delay (s)		19.4			20.4			31.6			24.5	
Approach LOS		B			C			C			C	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	71.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	59	220	96	86	282	250	114	330	113	175	328	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.98		1.00	1.00	0.96	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.97	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	0.96		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1650	3255		1693	3733	1732	1741	1807		1811	2017	
Flt Permitted	0.55	1.00		0.53	1.00	1.00	0.49	1.00		0.22	1.00	
Satd. Flow (perm)	954	3255		942	3733	1732	894	1807		418	2017	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	70	262	114	102	336	298	136	393	135	208	390	93
RTOR Reduction (vph)	0	79	0	0	0	143	0	20	0	0	13	0
Lane Group Flow (vph)	70	297	0	102	336	155	136	508	0	208	470	0
Confl. Peds. (#/hr)	28		30	30		28	38		44	44		38
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	2%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2			1	6
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	12.6	12.6		12.6	12.6	18.7	21.0	21.0		32.1	32.1	
Effective Green, g (s)	12.6	12.6		12.6	12.6	18.7	21.0	21.0		32.1	32.1	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.33	0.37	0.37		0.57	0.57	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	212	723		209	830	571	331	669		387	1142	
v/s Ratio Prot		0.09			0.09	0.03		c0.28		c0.06	0.23	
v/s Ratio Perm	0.07			c0.11		0.06	0.15			0.25		
v/c Ratio	0.33	0.41		0.49	0.40	0.27	0.41	0.76		0.54	0.41	
Uniform Delay, d1	18.5	18.9		19.2	18.8	14.0	13.3	15.6		8.2	7.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.5		2.4	0.4	0.4	1.1	5.4		1.8	0.3	
Delay (s)	19.8	19.4		21.7	19.3	14.3	14.4	21.0		10.1	7.3	
Level of Service	B	B		C	B	B	B	C		B	A	
Approach Delay (s)		19.4			17.6			19.7			8.1	
Approach LOS		B			B			B			A	

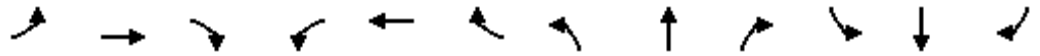
Intersection Summary

HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	56.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	21	88	109	3	124	184	60	120	6	118	251	38
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	27	113	140	4	159	236	77	154	8	151	322	49

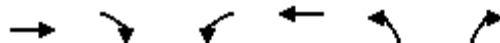
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	279	399	238	522
Volume Left (vph)	27	4	77	151
Volume Right (vph)	140	236	8	49
Hadj (s)	-0.28	-0.35	0.07	0.01
Departure Headway (s)	7.7	7.2	8.1	7.3
Degree Utilization, x	0.60	0.80	0.54	1.06
Capacity (veh/h)	440	478	410	485
Control Delay (s)	21.5	33.5	20.2	85.4
Approach Delay (s)	21.5	33.5	20.2	85.4
Approach LOS	C	D	C	F

Intersection Summary			
Delay		47.8	
HCM Level of Service		E	
Intersection Capacity Utilization	61.2%		ICU Level of Service B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	610	116	443	601	0	205
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	735	140	534	724	0	247
Pedestrians	159			2	12	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	14			0	1	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.99	0.99	0.99	0.99
vC, conflicting volume			747	2335	381	
vC1, stage 1 conf vol				747		
vC2, stage 2 conf vol				1589		
vCu, unblocked vol			735	2332	368	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)				5.8		
tF (s)			2.2	3.5	3.3	
p0 queue free %			38	100	60	
cM capacity (veh/h)			865	44	623	

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	367	367	140	267	267	362	362	247
Volume Left	0	0	0	267	267	0	0	0
Volume Right	0	0	140	0	0	0	0	247
cSH	1700	1700	1700	865	865	1700	1700	623
Volume to Capacity	0.22	0.22	0.08	0.62	0.62	0.21	0.21	0.40
Queue Length 95th (m)	0.0	0.0	0.0	33.3	33.3	0.0	0.0	14.4
Control Delay (s)	0.0	0.0	0.0	15.6	15.6	0.0	0.0	14.5
Lane LOS				C	C	B		
Approach Delay (s)	0.0			6.6			14.5	
Approach LOS							B	

Intersection Summary

Average Delay	5.0	
Intersection Capacity Utilization	43.5%	ICU Level of Service A
Analysis Period (min)	15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	98	285	191	331	394	8	178	52	26	264	13	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00	0.95		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1802	3544		1885	3756		1858	1875		1880	1707	
Flt Permitted	0.49	1.00		0.26	1.00		0.69	1.00		0.70	1.00	
Satd. Flow (perm)	927	3544		518	3756		1355	1875		1384	1707	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	111	324	217	376	448	9	202	59	30	300	15	84
RTOR Reduction (vph)	0	152	0	0	1	0	0	21	0	0	58	0
Lane Group Flow (vph)	111	389	0	376	456	0	202	68	0	300	41	0
Confl. Peds. (#/hr)	14					14	7		4	4		7
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	22.0	15.0		33.2	21.2		19.9	19.9		19.9	19.9	
Effective Green, g (s)	22.0	15.0		33.2	21.2		19.9	19.9		19.9	19.9	
Actuated g/C Ratio	0.34	0.23		0.51	0.33		0.31	0.31		0.31	0.31	
Clearance Time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	407	817		541	1223		414	573		423	522	
v/s Ratio Prot	0.03	0.11		c0.14	0.12			0.04			0.02	
v/s Ratio Perm	0.06			c0.21			0.15			c0.22		
v/c Ratio	0.27	0.48		0.70	0.37		0.49	0.12		0.71	0.08	
Uniform Delay, d1	15.2	21.7		10.7	16.8		18.4	16.3		20.0	16.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.6		4.2	0.3		1.2	0.1		5.8	0.1	
Delay (s)	15.7	22.2		14.9	17.1		19.7	16.4		25.8	16.2	
Level of Service	B	C		B	B		B	B		C	B	
Approach Delay (s)		21.1			16.1			18.7			23.4	
Approach LOS		C			B			B			C	

Intersection Summary

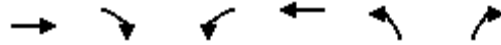
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	65.1	Sum of lost time (s)	11.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	109	91	55	170	143	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	99	60	185	155	14
Pedestrians					3	
Lane Width (m)					4.8	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			220			475 171
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			220			475 171
tC, single (s)			4.1			6.4 6.2
tC, 2 stage (s)						
tF (s)			2.2			3.5 3.3
p0 queue free %			95			70 98
cM capacity (veh/h)			1327			525 875

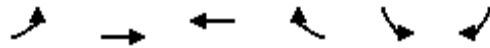
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	217	245	170
Volume Left	0	60	155
Volume Right	99	0	14
cSH	1700	1327	543
Volume to Capacity	0.13	0.05	0.31
Queue Length 95th (m)	0.0	1.1	10.1
Control Delay (s)	0.0	2.2	14.6
Lane LOS	A		B
Approach Delay (s)	0.0	2.2	14.6
Approach LOS	B		

Intersection Summary			
Average Delay			4.8
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)			15

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑			↑
Volume (veh/h)	0	972	802	87	0	65
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1057	872	95	0	71
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		59	163			
pX, platoon unblocked	0.94				0.97	0.94
vC, conflicting volume	966				1447	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	757				1051	91
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	92
cM capacity (veh/h)	802				215	895
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	528	528	349	349	269	71
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	95	71
cSH	1700	1700	1700	1700	1700	895
Volume to Capacity	0.31	0.31	0.21	0.21	0.16	0.08
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	1.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	9.4
Lane LOS						A
Approach Delay (s)	0.0		0.0			9.4
Approach LOS						A
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			30.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑	↗	↘↗	↑↑	↗	↘	↑↑	↗
Volume (vph)	71	634	925	183	841	123	517	461	60	146	1005	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1727	3642	1821	1763	3573	1808	3467	3696	1523	1707	3599	1780
Flt Permitted	0.12	1.00	1.00	0.13	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	214	3642	1821	249	3573	1808	3467	3696	1523	1707	3599	1780
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	82	729	1063	210	967	141	594	530	69	168	1155	47
RTOR Reduction (vph)	0	0	0	0	0	60	0	0	51	0	0	6
Lane Group Flow (vph)	82	729	1063	210	967	81	594	530	18	168	1155	41
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	4%	3%	0%	3%	5%	0%	0%	1%	19%	3%	1%	0%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	40.0	34.0	135.0	48.2	38.1	78.0	22.4	24.9	35.0	39.9	41.8	47.8
Effective Green, g (s)	40.0	34.0	135.0	48.2	38.1	78.0	22.4	24.9	35.0	39.9	41.8	47.8
Actuated g/C Ratio	0.30	0.25	1.00	0.36	0.28	0.58	0.17	0.18	0.26	0.30	0.31	0.35
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	131	917	1821	202	1008	1045	575	682	395	505	1114	630
v/s Ratio Prot	0.03	0.20		c0.08	0.27	0.02	c0.17	0.14	0.00	0.10	c0.32	0.00
v/s Ratio Perm	0.16		c0.58	c0.29		0.02			0.01			0.02
v/c Ratio	0.63	0.79	0.58	1.04	0.96	0.08	1.03	0.78	0.05	0.33	1.04	0.07
Uniform Delay, d1	38.0	47.2	0.0	37.0	47.7	12.6	56.3	52.4	37.5	37.1	46.6	28.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.0	5.5	1.4	74.1	19.4	0.0	46.3	5.6	0.0	0.4	37.0	0.0
Delay (s)	47.0	52.8	1.4	111.0	67.1	12.6	102.6	58.0	37.5	37.5	83.6	28.9
Level of Service	D	D	A	F	E	B	F	E	D	D	F	C
Approach Delay (s)		23.4			68.3			79.0			76.0	
Approach LOS		C			E			E			E	

Intersection Summary

HCM Average Control Delay	57.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	13.1
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	21	13	1076	2027	187
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	23	14	1157	2180	201
Pedestrians				2	1	
Lane Width (m)				3.8	3.4	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2888	829	2381			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2888	829	2381			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	93			
cM capacity (veh/h)	12	318	206			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	23	14	578	578	872	872	637
Volume Left	0	14	0	0	0	0	0
Volume Right	23	0	0	0	0	0	201
cSH	318	206	1700	1700	1700	1700	1700
Volume to Capacity	0.07	0.07	0.34	0.34	0.51	0.51	0.37
Queue Length 95th (m)	1.7	1.6	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	17.2	23.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	C					
Approach Delay (s)	17.2	0.3			0.0		
Approach LOS	C						

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization	54.0%		ICU Level of Service A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↑↑	↖	↖	↑↑	↖	↖	↑↑↑	↖
Volume (vph)	304	317	350	780	439	64	174	831	219	72	1502	276
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	6.2
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3733	1601	3390	3450	1615	1747	3693	1812	1725	5250	1813
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.08	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	3236	3733	1601	3390	3450	1615	140	3693	1812	314	5250	1813
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	342	356	393	876	493	72	196	934	246	81	1688	310
RTOR Reduction (vph)	0	0	3	0	0	17	0	0	62	0	0	51
Lane Group Flow (vph)	342	356	390	876	493	55	196	934	184	81	1688	259
Confl. Peds. (#/hr)			2	2			1					1
Heavy Vehicles (%)	1%	1%	0%	1%	0%	0%	1%	1%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	pm+pt		pm+ov	pm+pt		pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	19.8	18.5	33.2	36.7	35.5	43.9	67.3	53.2	89.9	55.1	46.7	66.5
Effective Green, g (s)	19.8	18.5	33.2	36.7	35.5	43.9	67.3	53.2	89.9	55.1	46.7	66.5
Actuated g/C Ratio	0.14	0.13	0.24	0.26	0.25	0.31	0.48	0.38	0.64	0.39	0.33	0.47
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	6.2
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	3.0
Lane Grp Cap (vph)	456	491	378	885	871	504	235	1397	1159	207	1744	858
v/s Ratio Prot	0.11	0.10	c0.11	c0.26	0.14	0.01	0.09	0.25	0.04	0.02	c0.32	0.04
v/s Ratio Perm			0.14			0.03	0.31		0.06	0.13		0.10
v/c Ratio	0.75	0.73	1.03	0.99	0.57	0.11	0.83	0.67	0.16	0.39	0.97	0.30
Uniform Delay, d1	58.0	58.6	53.7	51.8	45.8	34.4	39.8	36.4	10.2	29.0	46.2	22.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.8	5.3	54.7	27.4	0.8	0.1	21.7	1.6	0.1	1.2	14.8	0.2
Delay (s)	64.8	63.9	108.4	79.2	46.7	34.5	61.5	38.0	10.2	30.2	61.0	23.0
Level of Service	E	E	F	E	D	C	E	D	B	C	E	C
Approach Delay (s)		80.2			65.8			36.4			54.1	
Approach LOS		F			E			D			D	

Intersection Summary

HCM Average Control Delay	57.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	140.6	Sum of lost time (s)	17.8
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↑↑	↘
Volume (veh/h)	0	105	45	1216	2273	216
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	117	50	1351	2526	240
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	3301	1263	2526			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3301	1263	2526			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	28	71			
cM capacity (veh/h)	5	162	173			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	117	50	676	676	1263	1263	240
Volume Left	0	50	0	0	0	0	0
Volume Right	117	0	0	0	0	0	240
cSH	162	173	1700	1700	1700	1700	1700
Volume to Capacity	0.72	0.29	0.40	0.40	0.74	0.74	0.14
Queue Length 95th (m)	33.1	8.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	69.7	34.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	69.7	1.2			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		2.3	
Intersection Capacity Utilization	76.0%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	330	101	254	519	60	318	220	161	125	269	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1769	3507	1478	1734	3417		1744	3455	1723	1747	3389	
Flt Permitted	0.28	1.00	1.00	0.30	1.00		0.24	1.00	1.00	0.57	1.00	
Satd. Flow (perm)	521	3507	1478	556	3417		438	3455	1723	1045	3389	
Peak-hour factor, PHF	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Adj. Flow (vph)	77	452	138	348	711	82	436	301	221	171	368	116
RTOR Reduction (vph)	0	0	81	0	7	0	0	0	105	0	29	0
Lane Group Flow (vph)	77	452	57	348	786	0	436	301	116	171	455	0
Confl. Peds. (#/hr)	14		11	11		14	5					5
Heavy Vehicles (%)	0%	1%	2%	0%	1%	0%	0%	1%	0%	1%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	27.8	23.2	39.4	42.4	31.8		41.5	26.7	39.9	28.1	19.3	
Effective Green, g (s)	27.8	23.2	39.4	42.4	31.8		41.5	26.7	39.9	28.1	19.3	
Actuated g/C Ratio	0.29	0.24	0.41	0.44	0.33		0.43	0.28	0.42	0.29	0.20	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	211	848	700	408	1133		410	962	825	371	682	
v/s Ratio Prot	0.02	0.13	0.01	c0.12	0.23		c0.18	0.09	0.02	0.04	0.13	
v/s Ratio Perm	0.09		0.02	c0.26			c0.28		0.05	0.09		
v/c Ratio	0.36	0.53	0.08	0.85	0.69		1.06	0.31	0.14	0.46	0.67	
Uniform Delay, d1	25.4	31.6	17.2	19.9	27.8		22.2	27.3	17.4	26.6	35.3	
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	1.1	0.8	0.0	15.7	2.0		62.3	0.3	0.1	0.9	2.7	
Delay (s)	26.5	32.5	17.3	35.6	29.8		84.4	27.6	17.4	27.5	38.1	
Level of Service	C	C	B	D	C		F	C	B	C	D	
Approach Delay (s)		28.6			31.6			51.1			35.3	
Approach LOS		C			C			D			D	

Intersection Summary

HCM Average Control Delay	37.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	59	220	96	86	282	250	114	330	113	175	328	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	0.96		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1722	3319		1736	3733	1797	1762	1820		1813	2034	
Flt Permitted	0.58	1.00		0.56	1.00	1.00	0.52	1.00		0.27	1.00	
Satd. Flow (perm)	1043	3319		1017	3733	1797	963	1820		509	2034	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	60	224	98	88	288	255	116	337	115	179	335	80
RTOR Reduction (vph)	0	77	0	0	0	167	0	20	0	0	13	0
Lane Group Flow (vph)	60	245	0	88	288	88	116	432	0	179	402	0
Confl. Peds. (#/hr)	6		5	5		6	4		6	6		4
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	11.5	11.5		11.5	11.5	18.7	18.4	18.4		30.6	30.6	
Effective Green, g (s)	11.5	11.5		11.5	11.5	18.7	18.4	18.4		30.6	30.6	
Actuated g/C Ratio	0.21	0.21		0.21	0.21	0.35	0.34	0.34		0.57	0.57	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	222	706		216	794	621	328	619		461	1150	
v/s Ratio Prot		0.07			0.08	0.02		c0.24		0.05	c0.20	
v/s Ratio Perm	0.06			c0.09		0.03	0.12			0.17		
v/c Ratio	0.27	0.35		0.41	0.36	0.14	0.35	0.70		0.39	0.35	
Uniform Delay, d1	17.8	18.1		18.4	18.2	12.2	13.4	15.4		7.0	6.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.4		1.7	0.4	0.1	0.9	3.7		0.7	0.3	
Delay (s)	18.7	18.5		20.1	18.6	12.3	14.3	19.2		7.8	6.6	
Level of Service	B	B		C	B	B	B	B		A	A	
Approach Delay (s)		18.5			16.3			18.2			7.0	
Approach LOS		B			B			B			A	

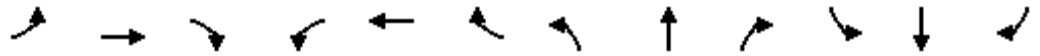
Intersection Summary

HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	54.1	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28

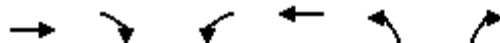


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	21	88	109	3	124	184	60	120	6	118	251	38
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	23	95	117	3	133	198	65	129	6	127	270	41
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	234	334	200	438								
Volume Left (vph)	23	3	65	127								
Volume Right (vph)	117	198	6	41								
Hadj (s)	-0.28	-0.35	0.05	0.00								
Departure Headway (s)	6.5	6.2	6.8	6.2								
Degree Utilization, x	0.42	0.58	0.38	0.76								
Capacity (veh/h)	480	524	445	545								
Control Delay (s)	14.2	17.3	14.0	26.0								
Approach Delay (s)	14.2	17.3	14.0	26.0								
Approach LOS	B	C	B	D								
Intersection Summary												
Delay			19.3									
HCM Level of Service			C									
Intersection Capacity Utilization			61.0%	ICU Level of Service	B							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	610	116	443	601	0	205
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	663	126	482	653	0	223
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised		Raised			
Median storage veh	1		1			
Upstream signal (m)	207					
pX, platoon unblocked			0.94		0.94	0.94
vC, conflicting volume			663		1953	332
vC1, stage 1 conf vol					663	
vC2, stage 2 conf vol					1290	
vCu, unblocked vol			512		1885	159
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			52		100	73
cM capacity (veh/h)			999		96	812

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1	
Volume Total	332	332	126	241	241	327	327	223	
Volume Left	0	0	0	241	241	0	0	0	
Volume Right	0	0	126	0	0	0	0	223	
cSH	1700	1700	1700	999	999	1700	1700	812	
Volume to Capacity	0.20	0.20	0.07	0.48	0.48	0.19	0.19	0.27	
Queue Length 95th (m)	0.0	0.0	0.0	20.4	20.4	0.0	0.0	8.5	
Control Delay (s)	0.0	0.0	0.0	11.9	11.9	0.0	0.0	11.1	
Lane LOS				B	B	B			
Approach Delay (s)	0.0			5.1			11.1		
Approach LOS							B		

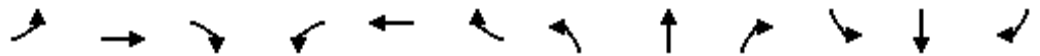
Intersection Summary

Average Delay	3.8	
Intersection Capacity Utilization	36.2%	ICU Level of Service A
Analysis Period (min)	15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Volume (vph)	98	285	191	331	394	8	178	52	26	264	13	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.94		1.00	1.00		1.00	0.95		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1885	3477		1884	3759		1884	1877		1884	1712	
Flt Permitted	0.46	1.00		0.21	1.00		0.68	1.00		0.69	1.00	
Satd. Flow (perm)	904	3477		416	3759		1356	1877		1370	1712	
Peak-hour factor, PHF	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Adj. Flow (vph)	129	375	251	436	518	11	234	68	34	347	17	97
RTOR Reduction (vph)	0	157	0	0	2	0	0	23	0	0	66	0
Lane Group Flow (vph)	129	469	0	436	527	0	234	79	0	347	48	0
Confl. Peds. (#/hr)			7	7			1		1	1		1
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	21.0	16.4		34.6	25.0		21.4	21.4		21.4	21.4	
Effective Green, g (s)	21.0	16.4		34.6	25.0		21.4	21.4		21.4	21.4	
Actuated g/C Ratio	0.31	0.24		0.51	0.37		0.31	0.31		0.31	0.31	
Clearance Time (s)	5.0	6.0		5.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	346	839		497	1382		427	591		431	539	
v/s Ratio Prot	0.03	0.13		c0.17	0.14			0.04			0.03	
v/s Ratio Perm	0.09			c0.28			0.17			c0.25		
v/c Ratio	0.37	0.56		0.88	0.38		0.55	0.13		0.81	0.09	
Uniform Delay, d1	17.4	22.6		13.0	15.8		19.3	16.7		21.4	16.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	1.0		16.3	0.2		1.8	0.1		11.0	0.1	
Delay (s)	18.4	23.6		29.4	16.1		21.1	16.8		32.4	16.5	
Level of Service	B	C		C	B		C	B		C	B	
Approach Delay (s)		22.7			22.1			19.8			28.5	
Approach LOS		C			C			B			C	

Intersection Summary

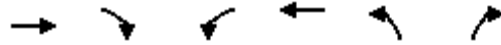
HCM Average Control Delay	23.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	68.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	109	91	55	170	143	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	130	108	65	202	170	15
Pedestrians					8	
Lane Width (m)					4.8	
Walking Speed (m/s)					1.2	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			246			192
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			246			192
tC, single (s)			4.1			6.2
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			95			98
cM capacity (veh/h)			1320			847

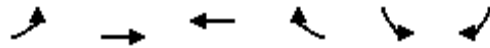
Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	238	268	186
Volume Left	0	65	170
Volume Right	108	0	15
cSH	1700	1320	504
Volume to Capacity	0.14	0.05	0.37
Queue Length 95th (m)	0.0	1.2	12.8
Control Delay (s)	0.0	2.3	16.2
Lane LOS		A	C
Approach Delay (s)	0.0	2.3	16.2
Approach LOS			C

Intersection Summary			
Average Delay			5.2
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)			15

HCM Unsignalized Intersection Capacity Analysis

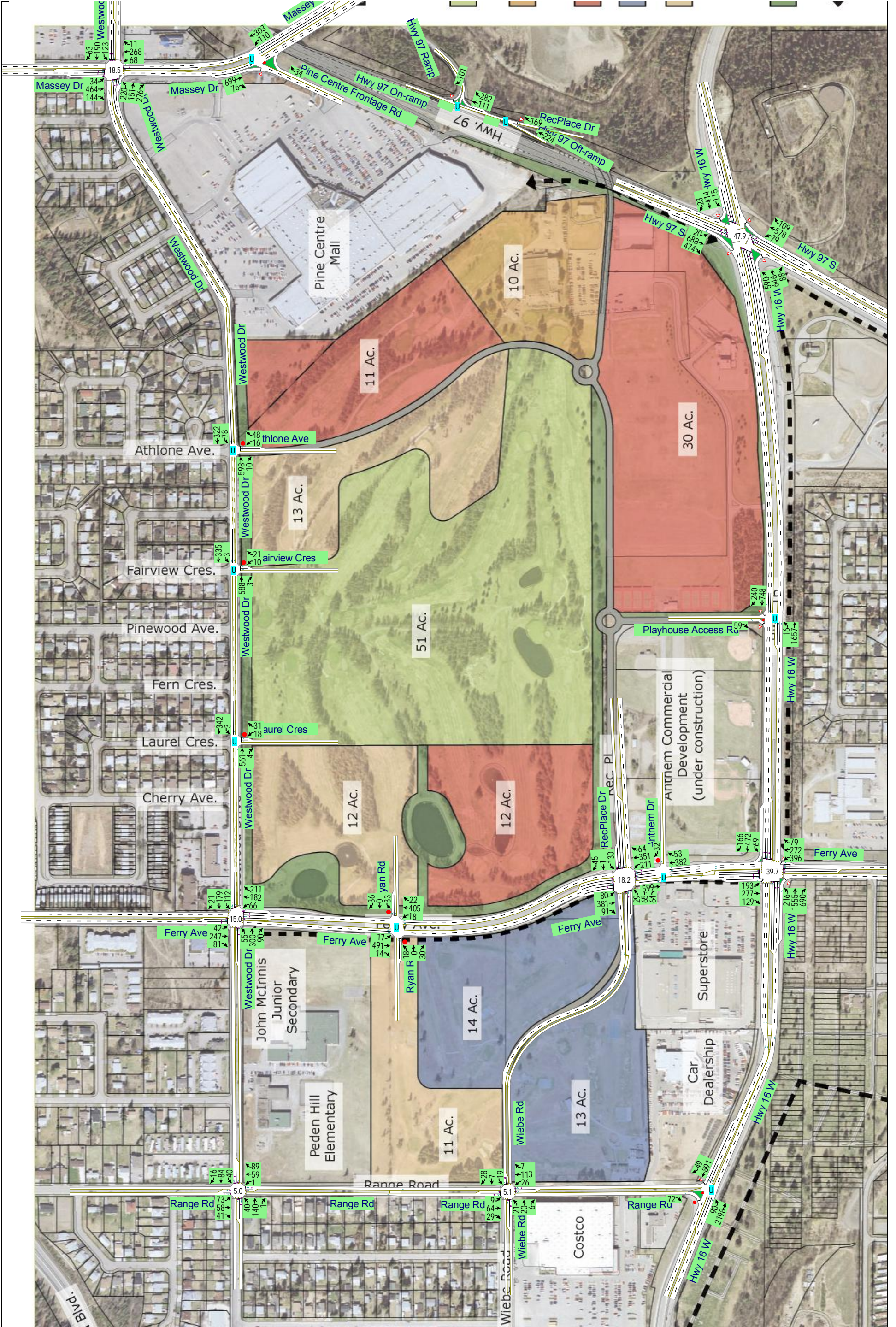
13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑			↑
Volume (veh/h)	0	972	802	87	0	65
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1057	872	95	0	71
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		59	163			
pX, platoon unblocked	0.94				0.95	0.94
vC, conflicting volume	966				1447	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	754				1005	88
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	92
cM capacity (veh/h)	804				226	899
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	528	528	349	349	269	71
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	95	71
cSH	1700	1700	1700	1700	1700	899
Volume to Capacity	0.31	0.31	0.21	0.21	0.16	0.08
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	1.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	9.3
Lane LOS						A
Approach Delay (s)	0.0		0.0			9.3
Approach LOS						A
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			30.2%		ICU Level of Service	A
Analysis Period (min)			15			

2023 Future Background Conditions and Full Development Conditions





HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	688	474	79	578	109	590	646	88	115	414	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1694	3539	1686	1713	3506	1735	3366	3624	1644	1724	3564	1670
Flt Permitted	0.32	1.00	1.00	0.18	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	574	3539	1686	331	3506	1735	3366	3624	1644	1724	3564	1670
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	23	782	539	90	657	124	670	734	100	131	470	26
RTOR Reduction (vph)	0	0	0	0	0	67	0	0	61	0	0	20
Lane Group Flow (vph)	23	782	539	90	657	57	670	734	39	131	470	6
Confl. Peds. (#/hr)	1					1	9		2	2		9
Heavy Vehicles (%)	6%	6%	8%	6%	7%	4%	3%	3%	9%	2%	2%	6%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	35.1	31.8	102.5	40.7	34.6	47.1	16.6	26.0	32.1	12.5	21.3	24.6
Effective Green, g (s)	35.1	31.8	102.5	40.7	34.6	47.1	16.6	26.0	32.1	12.5	21.3	24.6
Actuated g/C Ratio	0.34	0.31	1.00	0.40	0.34	0.46	0.16	0.25	0.31	0.12	0.21	0.24
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	233	1098	1686	214	1183	797	545	919	515	210	741	401
v/s Ratio Prot	0.00	c0.22		0.03	0.19	0.01	c0.20	0.20	0.00	0.08	c0.13	0.00
v/s Ratio Perm	0.03		c0.32	0.14		0.02			0.02			0.00
v/c Ratio	0.10	0.71	0.32	0.42	0.56	0.07	1.23	0.80	0.08	0.62	0.63	0.02
Uniform Delay, d1	22.7	31.3	0.0	21.3	27.7	15.5	42.9	35.8	24.8	42.8	37.0	29.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	2.7	0.5	1.3	1.0	0.0	118.6	4.9	0.1	5.7	1.8	0.0
Delay (s)	22.9	34.0	0.5	22.6	28.6	15.5	161.6	40.7	24.8	48.4	38.8	29.7
Level of Service	C	C	A	C	C	B	F	D	C	D	D	C
Approach Delay (s)		20.4			26.1			93.5			40.5	
Approach LOS		C			C			F			D	

Intersection Summary

HCM Average Control Delay	49.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	21.2
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	59	16	1657	748	240
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	70	19	1973	890	286
Pedestrians					3	
Lane Width (m)					3.4	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.55					
vC, conflicting volume	2061	440	890			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1289	440	890			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	88	98			
cM capacity (veh/h)	85	571	770			

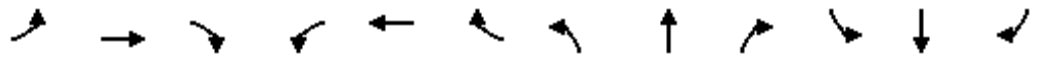
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	70	19	986	986	356	356	464
Volume Left	0	19	0	0	0	0	0
Volume Right	70	0	0	0	0	0	286
cSH	571	770	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.02	0.58	0.58	0.21	0.21	0.27
Queue Length 95th (m)	3.2	0.6	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.2	9.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	12.2	0.1			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↑↑	↖	↖↗	↑↑	↖	↖	↑↑↑	↖
Volume (vph)	193	277	129	396	272	79	216	1555	690	69	472	166
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3697	1583	3292	3450	1568	3424	3622	1830	1675	5148	1808
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	3236	3697	1583	3292	3450	1568	3424	3622	1830	145	5148	1808
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	210	301	140	430	296	86	235	1690	750	75	513	180
RTOR Reduction (vph)	0	0	104	0	0	18	0	0	68	0	0	0
Lane Group Flow (vph)	210	301	36	430	296	68	235	1690	682	75	513	180
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	2%	2%	4%	0%	3%	0%	3%	0%	3%	3%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	12.1	14.7	27.3	16.8	19.5	25.5	12.6	55.4	72.2	54.6	48.6	116.7
Effective Green, g (s)	12.1	14.7	27.3	16.8	19.5	25.5	12.6	55.4	72.2	54.6	48.6	116.7
Actuated g/C Ratio	0.10	0.13	0.23	0.14	0.17	0.22	0.11	0.47	0.62	0.47	0.42	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	336	466	370	474	576	343	370	1719	1132	147	2144	1808
v/s Ratio Prot	0.06	c0.08	0.01	c0.13	0.09	0.01	c0.07	c0.47	0.09	0.03	0.10	
v/s Ratio Perm			0.01			0.03			0.29	0.21		c0.10
v/c Ratio	0.62	0.65	0.10	0.91	0.51	0.20	0.64	0.98	0.60	0.51	0.24	0.10
Uniform Delay, d1	50.1	48.5	35.0	49.2	44.3	37.3	49.8	30.2	13.5	26.2	22.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	3.1	0.1	20.8	0.8	0.3	3.5	17.8	0.9	3.0	0.1	0.1
Delay (s)	53.7	51.6	35.2	70.0	45.1	37.5	53.4	48.0	14.4	29.2	22.2	0.1
Level of Service	D	D	D	E	D	D	D	D	B	C	C	A
Approach Delay (s)		48.7			57.5			39.1			17.7	
Approach LOS		D			E			D			B	

Intersection Summary		
HCM Average Control Delay	40.1	HCM Level of Service D
HCM Volume to Capacity ratio	0.92	
Actuated Cycle Length (s)	116.7	Sum of lost time (s) 24.0
Intersection Capacity Utilization	86.4%	ICU Level of Service E
Analysis Period (min)	15	

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↓↓	↙
Volume (veh/h)	0	72	90	2198	891	49
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	77	96	2338	948	52
Pedestrians				1		
Lane Width (m)				3.7		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2309	475	948			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2309	475	948			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	86	87			
cM capacity (veh/h)	29	541	720			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	77	96	1169	1169	474	474	52
Volume Left	0	96	0	0	0	0	0
Volume Right	77	0	0	0	0	0	52
cSH	541	720	1700	1700	1700	1700	1700
Volume to Capacity	0.14	0.13	0.69	0.69	0.28	0.28	0.03
Queue Length 95th (m)	3.7	3.5	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.8	10.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B					
Approach Delay (s)	12.8	0.4			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		71.1%	ICU Level of Service C
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	464	144	68	268	11	220	151	276	123	190	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3542	1478	1734	3489		1726	3421	1704	1761	3328	
Flt Permitted	0.57	1.00	1.00	0.34	1.00		0.49	1.00	1.00	0.65	1.00	
Satd. Flow (perm)	986	3542	1478	625	3489		889	3421	1704	1202	3328	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	504	157	74	291	12	239	164	300	134	207	68
RTOR Reduction (vph)	0	0	93	0	3	0	0	0	139	0	39	0
Lane Group Flow (vph)	37	504	64	74	300	0	239	164	161	134	236	0
Confl. Peds. (#/hr)	7		10	10		7	5		5	5		5
Heavy Vehicles (%)	7%	0%	2%	0%	0%	0%	1%	2%	0%	0%	1%	4%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	22.0	19.8	27.9	29.6	23.6		21.2	13.1	19.1	17.0	11.0	
Effective Green, g (s)	22.0	19.8	27.9	29.6	23.6		21.2	13.1	19.1	17.0	11.0	
Actuated g/C Ratio	0.32	0.29	0.40	0.43	0.34		0.31	0.19	0.28	0.25	0.16	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	336	1018	727	365	1195		372	650	621	345	531	
v/s Ratio Prot	0.00	c0.14	0.01	0.02	c0.09		c0.08	0.05	c0.02	0.03	0.07	
v/s Ratio Perm	0.03		0.03	0.07			c0.12		0.07	0.06		
v/c Ratio	0.11	0.50	0.09	0.20	0.25		0.64	0.25	0.26	0.39	0.45	
Uniform Delay, d1	16.3	20.4	12.6	12.0	16.3		19.2	23.7	19.4	21.2	26.2	
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	0.1	0.5	0.1	0.3	0.2		3.8	0.3	0.2	0.7	0.8	
Delay (s)	16.5	20.9	12.7	12.3	16.4		23.0	24.0	19.6	21.9	27.0	
Level of Service	B	C	B	B	B		C	C	B	C	C	
Approach Delay (s)		18.8			15.6			21.8			25.3	
Approach LOS		B			B			C			C	

Intersection Summary

HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	68.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	42	247	81	66	182	211	55	300	90	112	179	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.97	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		0.99	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3324		1719	3697	1743	1739	1792		1759	2061	
Flt Permitted	0.62	1.00		0.53	1.00	1.00	0.62	1.00		0.28	1.00	
Satd. Flow (perm)	1113	3324		955	3697	1743	1126	1792		515	2061	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	48	284	93	76	209	243	63	345	103	129	206	24
RTOR Reduction (vph)	0	51	0	0	0	162	0	18	0	0	6	0
Lane Group Flow (vph)	48	326	0	76	209	81	63	430	0	129	224	0
Confl. Peds. (#/hr)	15		16	16		15	30		20	20		30
Heavy Vehicles (%)	0%	0%	2%	0%	2%	2%	0%	2%	1%	3%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	11.8	11.8		11.8	11.8	17.9	18.6	18.6		29.7	29.7	
Effective Green, g (s)	11.8	11.8		11.8	11.8	17.9	18.6	18.6		29.7	29.7	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.33	0.35	0.35		0.56	0.56	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	245	733		211	815	583	391	623		428	1144	
v/s Ratio Prot		c0.10			0.06	0.02		c0.24		c0.03	0.11	
v/s Ratio Perm	0.04			0.08		0.03	0.06			0.13		
v/c Ratio	0.20	0.44		0.36	0.26	0.14	0.16	0.69		0.30	0.20	
Uniform Delay, d1	17.0	18.0		17.7	17.2	12.4	12.1	15.0		6.9	5.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.6		1.4	0.2	0.2	0.3	3.6		0.5	0.1	
Delay (s)	17.5	18.6		19.1	17.5	12.6	12.3	18.5		7.5	6.1	
Level of Service	B	B		B	B	B	B	B		A	A	
Approach Delay (s)		18.5			15.4			17.8			6.6	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	73	58	41	1	59	89	40	140	1	40	84	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		0.99	1.00		0.97	1.00	
Frt	1.00	0.94		1.00	0.91		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2006	1995		1925	1753		1983	2161		1898	2073	
Flt Permitted	0.91	1.00		0.91	1.00		0.68	1.00		0.65	1.00	
Satd. Flow (perm)	1919	1995		1842	1753		1426	2161		1308	2073	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	84	67	47	1	68	102	46	161	1	46	97	18
RTOR Reduction (vph)	0	38	0	0	83	0	0	1	0	0	9	0
Lane Group Flow (vph)	84	76	0	1	87	0	46	161	0	46	106	0
Confl. Peds. (#/hr)	33					33	10		42	42		10
Heavy Vehicles (%)	0%	0%	3%	0%	0%	4%	3%	0%	0%	4%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.4	4.4		4.4	4.4		11.7	11.7		11.7	11.7	
Effective Green, g (s)	4.4	4.4		4.4	4.4		11.7	11.7		11.7	11.7	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.49	0.49		0.49	0.49	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	350	364		336	320		692	1049		635	1006	
v/s Ratio Prot		0.04			c0.05			c0.07			0.05	
v/s Ratio Perm	0.04			0.00			0.03			0.04		
v/c Ratio	0.24	0.21		0.00	0.27		0.07	0.15		0.07	0.11	
Uniform Delay, d1	8.4	8.4		8.1	8.5		3.3	3.4		3.3	3.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.0	0.5		0.0	0.1		0.0	0.0	
Delay (s)	8.8	8.7		8.1	8.9		3.3	3.5		3.4	3.4	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		8.7			8.9			3.5			3.4	
Approach LOS		A			A			A			A	

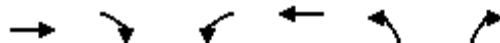
Intersection Summary

HCM Average Control Delay	6.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	24.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗	↖↗	↑↑		↗
Volume (veh/h)	699	76	110	303	0	34
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	863	94	136	374	0	42
Pedestrians	90			5	5	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	8			0	0	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.93	0.93	0.93	
vC, conflicting volume			868	1417	441	
vC1, stage 1 conf vol				868		
vC2, stage 2 conf vol				549		
vCu, unblocked vol			698	1290	238	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)				5.8		
tF (s)			2.2	3.5	3.3	
p0 queue free %			84	100	94	
cM capacity (veh/h)			830	244	707	

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	431	431	94	68	68	187	187	42
Volume Left	0	0	0	68	68	0	0	0
Volume Right	0	0	94	0	0	0	0	42
cSH	1700	1700	1700	830	830	1700	1700	707
Volume to Capacity	0.25	0.25	0.06	0.16	0.16	0.11	0.11	0.06
Queue Length 95th (m)	0.0	0.0	0.0	4.4	4.4	0.0	0.0	1.4
Control Delay (s)	0.0	0.0	0.0	10.2	10.2	0.0	0.0	10.4
Lane LOS				B	B	B		
Approach Delay (s)	0.0			2.7			10.4	
Approach LOS							B	

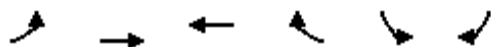
Intersection Summary

Average Delay	1.2	
Intersection Capacity Utilization	37.5%	ICU Level of Service A
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis

9: Hwy 97 On-ramp & Hwy 97 Ramp

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑	↗		↗
Volume (veh/h)	0	0	111	282	0	101
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	121	307	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	121				121	121
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	121				121	121
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	88
cM capacity (veh/h)	1467				875	931

Direction, Lane #	WB 1	WB 2	SB 1
Volume Total	121	307	110
Volume Left	0	0	0
Volume Right	0	307	110
cSH	1700	1700	931
Volume to Capacity	0.07	0.18	0.12
Queue Length 95th (m)	0.0	0.0	3.0
Control Delay (s)	0.0	0.0	9.4
Lane LOS			A
Approach Delay (s)	0.0		9.4
Approach LOS			A

Intersection Summary			
Average Delay		1.9	
Intersection Capacity Utilization	20.8%		ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	381	91	211	351	64	29	65	64	130	1	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3657	3733	1670	3621	3643		1885	1984	1118	3657	1984	1677
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.58	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3657	3733	1670	3621	3643		1150	1984	1118	3657	1984	1677
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	100	476	114	264	439	80	36	81	80	162	1	56
RTOR Reduction (vph)	0	0	66	0	17	0	0	0	48	0	0	48
Lane Group Flow (vph)	100	476	48	264	502	0	36	81	32	162	1	8
Confl. Peds. (#/hr)	5		5	5		5	1		2	2		1
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	0%	50%	0%	0%	0%
Turn Type	Prot		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4				2		2			6
Actuated Green, G (s)	4.7	14.9	24.2	8.3	18.5		16.2	6.9	15.2	6.4	4.0	8.7
Effective Green, g (s)	4.7	14.9	24.2	8.3	18.5		16.2	6.9	15.2	6.4	4.0	8.7
Actuated g/C Ratio	0.08	0.26	0.42	0.14	0.32		0.28	0.12	0.26	0.11	0.07	0.15
Clearance Time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	299	967	703	523	1172		443	238	296	407	138	254
v/s Ratio Prot	0.03	0.13	0.01	c0.07	c0.14		0.01	c0.04	0.02	c0.04	0.00	0.00
v/s Ratio Perm			0.02				0.01		0.01			0.00
v/c Ratio	0.33	0.49	0.07	0.50	0.43		0.08	0.34	0.11	0.40	0.01	0.03
Uniform Delay, d1	24.9	18.1	9.9	22.7	15.3		15.2	23.2	16.0	23.8	24.9	20.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.5	0.0	1.0	0.3		0.1	1.2	0.2	0.6	0.0	0.1
Delay (s)	25.8	18.6	10.0	23.8	15.7		15.3	24.4	16.2	24.4	24.9	20.9
Level of Service	C	B	A	C	B		B	C	B	C	C	C
Approach Delay (s)		18.2			18.4			19.4			23.5	
Approach LOS		B			B			B			C	

Intersection Summary

HCM Average Control Delay	19.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	57.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	9	64	29	26	113	7	21	20	6	19	7	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1939		2041	2113		2043	1784		1750	1624	
Flt Permitted	0.89	1.00		0.89	1.00		0.73	1.00		0.74	1.00	
Satd. Flow (perm)	1637	1939		1909	2113		1575	1784		1360	1624	
Peak-hour factor, PHF	0.92	0.82	0.82	0.82	0.82	0.92	0.82	0.92	0.82	0.92	0.92	0.92
Adj. Flow (vph)	10	78	35	32	138	8	26	22	7	21	8	30
RTOR Reduction (vph)	0	28	0	0	6	0	0	4	0	0	16	0
Lane Group Flow (vph)	10	85	0	32	140	0	26	25	0	21	22	0
Confl. Peds. (#/hr)			4	4			2					
Heavy Vehicles (%)	2%	0%	0%	0%	1%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	4.5	4.5		4.5	4.5		11.0	11.0		11.0	11.0	
Effective Green, g (s)	4.5	4.5		4.5	4.5		11.0	11.0		11.0	11.0	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.47	0.47		0.47	0.47	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	313	371		366	405		737	835		637	760	
v/s Ratio Prot		0.04			c0.07			0.01			0.01	
v/s Ratio Perm	0.01			0.02			c0.02			0.02		
v/c Ratio	0.03	0.23		0.09	0.34		0.04	0.03		0.03	0.03	
Uniform Delay, d1	7.7	8.0		7.8	8.2		3.4	3.4		3.4	3.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.3		0.1	0.5		0.0	0.0		0.0	0.0	
Delay (s)	7.8	8.3		7.9	8.7		3.4	3.4		3.4	3.4	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		8.3			8.6			3.4			3.4	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	23.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	16	48	598	10	78	322
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)	17	52	650	11	85	350
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			TWLTL			TWLTL
Median storage veh			2			2
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1175	655			661	
vC1, stage 1 conf vol	655					
vC2, stage 2 conf vol	520					
vCu, unblocked vol	1175	655			661	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	89			91	
cM capacity (veh/h)	407	466			927	

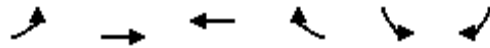
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	70	661	85	350
Volume Left	17	0	85	0
Volume Right	52	11	0	0
cSH	621	1700	927	1700
Volume to Capacity	0.11	0.39	0.09	0.21
Queue Length 95th (m)	2.9	0.0	2.3	0.0
Control Delay (s)	13.8	0.0	9.3	0.0
Lane LOS	B		A	
Approach Delay (s)	13.8	0.0	1.8	
Approach LOS	B			

Intersection Summary			
Average Delay		1.5	
Intersection Capacity Utilization		49.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	599	382	53	0	32
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	651	415	58	0	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		59	163			
pX, platoon unblocked					0.90	
vC, conflicting volume	473				770	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	473				526	133
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	96
cM capacity (veh/h)	1085				434	892

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	326	326	119	119	119	117	35
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	58	35
cSH	1700	1700	1700	1700	1700	1700	892
Volume to Capacity	0.19	0.19	0.07	0.07	0.07	0.07	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	9.2
Lane LOS							A
Approach Delay (s)	0.0		0.0				9.2
Approach LOS							A

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		19.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	21	588	3	3	335
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	23	639	3	3	364
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1011	641			642	
vC1, stage 1 conf vol	641					
vC2, stage 2 conf vol	371					
vCu, unblocked vol	1011	641			642	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	95			100	
cM capacity (veh/h)	465	475			942	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	34	642	3	364
Volume Left	11	0	3	0
Volume Right	23	3	0	0
cSH	701	1700	942	1700
Volume to Capacity	0.05	0.38	0.00	0.21
Queue Length 95th (m)	1.1	0.0	0.1	0.0
Control Delay (s)	13.0	0.0	8.8	0.0
Lane LOS	B		A	
Approach Delay (s)	13.0	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		41.1%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	18	31	561	4	3	342
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	34	610	4	3	372
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage (veh)			2		2	
Upstream signal (m)			265			
pX, platoon unblocked	0.92	0.92			0.92	
vC, conflicting volume	990	612			614	
vC1, stage 1 conf vol	612					
vC2, stage 2 conf vol	378					
vCu, unblocked vol	943	530			532	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	93			100	
cM capacity (veh/h)	473	503			948	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	53	614	3	372
Volume Left	20	0	3	0
Volume Right	34	4	0	0
cSH	794	1700	948	1700
Volume to Capacity	0.07	0.36	0.00	0.22
Queue Length 95th (m)	1.6	0.0	0.1	0.0
Control Delay (s)	12.8	0.0	8.8	0.0
Lane LOS	B		A	
Approach Delay (s)	12.8	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		39.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↕	↗		↕	↗
Volume (veh/h)	17	491	14	18	405	22	18	0	30	33	0	36
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	534	15	20	440	24	20	0	33	36	0	39
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									4			4
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)		240			353							
pX, platoon unblocked												
vC, conflicting volume	464			549			838	1082	274	795	1077	232
vC1, stage 1 conf vol							578	578		491	491	
vC2, stage 2 conf vol							259	503		304	586	
vCu, unblocked vol	464			549			838	1082	274	795	1077	232
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			98			94	100	95	90	100	95
cM capacity (veh/h)	1093			1017			350	324	723	374	323	770

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	285	282	240	244	52	75
Volume Left	18	0	20	0	20	36
Volume Right	0	15	0	24	33	39
cSH	1093	1700	1017	1700	934	781
Volume to Capacity	0.02	0.17	0.02	0.14	0.06	0.10
Queue Length 95th (m)	0.4	0.0	0.4	0.0	1.3	2.4
Control Delay (s)	0.7	0.0	0.9	0.0	12.3	12.7
Lane LOS	A		A		B	B
Approach Delay (s)	0.4		0.4		12.3	12.7
Approach LOS					B	B

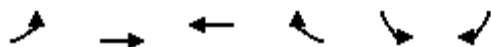
Intersection Summary

Average Delay	1.7
Intersection Capacity Utilization	41.6%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis

37: Hwy 97 Ramp & RecPlace Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑			↗
Volume (veh/h)	0	0	224	0	0	169
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	243	0	0	184
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	243				243	243
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				243	243
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	77
cM capacity (veh/h)	1323				745	795

























Direction, Lane #	WB 1	SB 1
Volume Total	243	184
Volume Left	0	0
Volume Right	0	184
cSH	1700	795
Volume to Capacity	0.14	0.23
Queue Length 95th (m)	0.0	6.8
Control Delay (s)	0.0	10.9
Lane LOS		B
Approach Delay (s)	0.0	10.9
Approach LOS		B

Intersection Summary			
Average Delay		4.7	
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	634	1147	183	841	165	517	701	60	146	1547	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1796	3506	1785	1780	3573	1792	3399	3660	1498	1741	3635	1763
Flt Permitted	0.12	1.00	1.00	0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	222	3506	1785	267	3573	1792	3399	3660	1498	1741	3635	1763
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	689	1247	199	914	179	562	762	65	159	1682	45
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	45	0	0	3
Lane Group Flow (vph)	77	689	1247	199	914	132	562	762	20	159	1682	42
Confl. Peds. (#/hr)	1					1	9					9
Heavy Vehicles (%)	0%	7%	2%	2%	5%	1%	2%	2%	21%	1%	0%	0%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	40.0	34.0	145.0	43.0	35.5	75.9	19.4	37.0	44.5	40.4	57.4	63.4
Effective Green, g (s)	40.0	34.0	145.0	43.0	35.5	75.9	19.4	37.0	44.5	40.4	57.4	63.4
Actuated g/C Ratio	0.28	0.23	1.00	0.30	0.24	0.52	0.13	0.26	0.31	0.28	0.40	0.44
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	126	822	1785	157	875	938	455	934	460	485	1439	771
v/s Ratio Prot	0.03	0.20		c0.07	0.26	0.04	c0.17	0.21	0.00	0.09	c0.46	0.00
v/s Ratio Perm	0.14		c0.70	c0.31		0.03			0.01			0.02
v/c Ratio	0.61	0.84	0.70	1.27	1.04	0.14	1.24	0.82	0.04	0.33	1.17	0.05
Uniform Delay, d1	43.0	52.9	0.0	46.8	54.8	17.8	62.8	50.8	35.3	41.5	43.8	23.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	8.3	2.3	161.0	42.7	0.1	123.6	5.6	0.0	0.4	83.8	0.0
Delay (s)	51.4	61.2	2.3	207.8	97.5	17.8	186.4	56.4	35.3	41.9	127.6	23.6
Level of Service	D	E	A	F	F	B	F	E	D	D	F	C
Approach Delay (s)		24.3			103.4			108.0			117.9	
Approach LOS		C			F			F			F	

Intersection Summary

HCM Average Control Delay	84.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	19.7
Intersection Capacity Utilization	108.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↘
Volume (veh/h)	0	186	47	1317	2442	577
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	202	51	1432	2654	627
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.80					
vC, conflicting volume	3786	1198	2654			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3983	1198	2654			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	68			
cM capacity (veh/h)	1	181	161			

































Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	202	51	716	716	1062	1062	1158
Volume Left	0	51	0	0	0	0	0
Volume Right	202	0	0	0	0	0	627
cSH	181	161	1700	1700	1700	1700	1700
Volume to Capacity	1.12	0.32	0.42	0.42	0.62	0.62	0.68
Queue Length 95th (m)	76.9	9.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	154.4	37.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	154.4	1.3			0.0		
Approach LOS	F						

Intersection Summary							
Average Delay			6.7				
Intersection Capacity Utilization		78.2%		ICU Level of Service		D	
Analysis Period (min)		15					

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 		 	 		 	 			  	
Volume (vph)	545	399	454	780	596	64	341	865	219	93	1646	691
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3770	1597	3390	3450	1594	3424	3622	1812	1725	5250	1830
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.19	1.00	1.00
Satd. Flow (perm)	3236	3770	1597	3390	3450	1594	3424	3622	1812	341	5250	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	592	434	493	848	648	70	371	940	238	101	1789	751
RTOR Reduction (vph)	0	0	2	0	0	12	0	0	53	0	0	0
Lane Group Flow (vph)	592	434	491	848	648	58	371	940	185	101	1789	751
Confl. Peds. (#/hr)	3		5	5		3						
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	3%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	27.2	20.9	40.0	34.9	28.7	37.9	19.1	55.9	90.8	55.0	45.8	144.7
Effective Green, g (s)	27.2	20.9	40.0	34.9	28.7	37.9	19.1	55.9	90.8	55.0	45.8	144.7
Actuated g/C Ratio	0.19	0.14	0.28	0.24	0.20	0.26	0.13	0.39	0.63	0.38	0.32	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	608	545	441	818	684	418	452	1399	1137	218	1662	1830
v/s Ratio Prot	c0.18	0.12	c0.15	c0.25	0.19	0.01	0.11	0.26	0.04	0.03	c0.34	
v/s Ratio Perm			0.16			0.03			0.06	0.15		0.41
v/c Ratio	0.97	0.80	1.11	1.04	0.95	0.14	0.82	0.67	0.16	0.46	1.08	0.41
Uniform Delay, d1	58.4	59.8	52.4	54.9	57.3	40.9	61.1	36.8	11.2	30.8	49.4	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	29.7	7.9	77.3	41.3	22.1	0.2	11.4	1.7	0.1	1.6	45.8	0.7
Delay (s)	88.1	67.8	129.6	96.2	79.4	41.1	72.5	38.5	11.2	32.4	95.3	0.7
Level of Service	F	E	F	F	E	D	E	D	B	C	F	A
Approach Delay (s)		95.8			86.8			42.4			66.0	
Approach LOS		F			F			D			E	
Intersection Summary												
HCM Average Control Delay			71.7				HCM Level of Service			E		
HCM Volume to Capacity ratio			1.08									
Actuated Cycle Length (s)			144.7				Sum of lost time (s)		24.4			
Intersection Capacity Utilization			97.5%				ICU Level of Service		F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕↗	↕↖	↗
Volume (veh/h)	0	181	68	1417	2521	216
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.92
Hourly flow rate (vph)	0	195	73	1524	2711	235
Pedestrians	1					
Lane Width (m)	4.8					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	3620	1356	2712			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3620	1356	2712			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	52			
cM capacity (veh/h)	2	140	153			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	195	73	762	762	1355	1355	235
Volume Left	0	73	0	0	0	0	0
Volume Right	195	0	0	0	0	0	235
cSH	140	153	1700	1700	1700	1700	1700
Volume to Capacity	1.39	0.48	0.45	0.45	0.80	0.80	0.14
Queue Length 95th (m)	95.8	17.1	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	272.2	48.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	272.2	2.2			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		11.9	
Intersection Capacity Utilization	87.6%		ICU Level of Service E
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	330	308	265	519	60	419	253	228	125	375	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1769	3542	1497	1732	3450		1743	3490	1681	1760	3417	
Flt Permitted	0.40	1.00	1.00	0.34	1.00		0.24	1.00	1.00	0.59	1.00	
Satd. Flow (perm)	750	3542	1497	626	3450		432	3490	1681	1094	3417	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	58	340	318	273	535	62	432	261	235	129	387	88
RTOR Reduction (vph)	0	0	76	0	7	0	0	0	96	0	16	0
Lane Group Flow (vph)	58	340	242	273	590	0	432	261	139	129	459	0
Confl. Peds. (#/hr)	6		13	13		6	11		6	6		11
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	23.4	18.8	45.0	38.2	27.6		52.3	40.2	53.6	26.2	20.1	
Effective Green, g (s)	23.4	18.8	45.0	38.2	27.6		52.3	40.2	53.6	26.2	20.1	
Actuated g/C Ratio	0.23	0.18	0.44	0.37	0.27		0.51	0.39	0.52	0.26	0.20	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	217	650	745	378	929		556	1369	977	319	670	
v/s Ratio Prot	0.01	0.10	0.08	c0.09	0.17		c0.20	0.07	0.02	0.02	0.13	
v/s Ratio Perm	0.05		0.08	c0.17			c0.20		0.06	0.08		
v/c Ratio	0.27	0.52	0.33	0.72	0.63		0.78	0.19	0.14	0.40	0.68	
Uniform Delay, d1	31.6	37.8	18.8	24.5	33.0		18.0	20.5	12.6	30.6	38.3	
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	0.7	1.0	0.3	6.7	1.6		6.7	0.1	0.1	0.8	3.2	
Delay (s)	32.2	38.8	19.1	31.2	34.6		24.8	20.6	12.7	31.5	41.4	
Level of Service	C	D	B	C	C		C	C	B	C	D	
Approach Delay (s)		29.5			33.5			20.5			39.3	
Approach LOS		C			C			C			D	

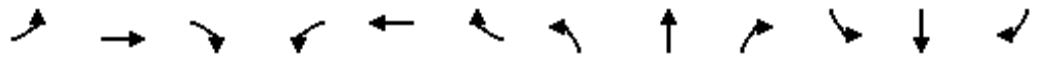
Intersection Summary

HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



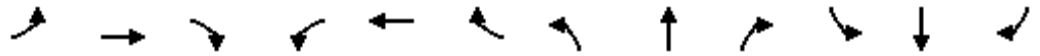
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	80	380	96	86	387	350	114	358	113	241	363	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.95	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.97	1.00		0.98	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.96		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1656	3325		1706	3733	1727	1741	1812		1812	2007	
Flt Permitted	0.45	1.00		0.35	1.00	1.00	0.46	1.00		0.17	1.00	
Satd. Flow (perm)	784	3325		628	3733	1727	840	1812		323	2007	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	95	452	114	102	461	417	136	426	135	287	432	118
RTOR Reduction (vph)	0	35	0	0	0	112	0	18	0	0	15	0
Lane Group Flow (vph)	95	531	0	102	461	305	136	543	0	287	535	0
Confl. Peds. (#/hr)	28		30	30		28	38		44	44		38
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	2%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	15.2	15.2		15.2	15.2	22.3	21.8	21.8		33.9	33.9	
Effective Green, g (s)	15.2	15.2		15.2	15.2	22.3	21.8	21.8		33.9	33.9	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.36	0.36	0.36		0.55	0.55	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	195	827		156	929	630	300	647		352	1114	
v/s Ratio Prot		0.16			0.12	0.06		0.30		c0.09	0.27	
v/s Ratio Perm	0.12			c0.16		0.12	0.16			c0.36		
v/c Ratio	0.49	0.64		0.65	0.50	0.48	0.45	0.84		0.82	0.48	
Uniform Delay, d1	19.6	20.5		20.6	19.7	15.0	15.1	18.0		10.6	8.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	1.9		10.4	0.6	0.8	1.5	9.8		14.2	0.4	
Delay (s)	22.2	22.4		31.0	20.2	15.8	16.6	27.8		24.8	8.7	
Level of Service	C	C		C	C	B	B	C		C	A	
Approach Delay (s)		22.4			19.5			25.6			14.2	
Approach LOS		C			B			C			B	

Intersection Summary		
HCM Average Control Delay	20.0	HCM Level of Service C
HCM Volume to Capacity ratio	0.72	
Actuated Cycle Length (s)	61.1	Sum of lost time (s) 11.0
Intersection Capacity Utilization	79.1%	ICU Level of Service D
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	117	109	3	228	184	60	148	6	127	277	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.93		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2043	1975		1921	1871		2029	2109		2022	2074	
Flt Permitted	0.32	1.00		0.58	1.00		0.43	1.00		0.63	1.00	
Satd. Flow (perm)	691	1975		1178	1871		920	2109		1348	2074	
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)	27	150	140	4	292	236	77	190	8	163	355	49
RTOR Reduction (vph)	0	84	0	0	73	0	0	4	0	0	14	0
Lane Group Flow (vph)	27	206	0	4	455	0	77	194	0	163	390	0
Confl. Peds. (#/hr)	3		3	3		3	24		2	2		24
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	3%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.8	12.8		12.8	12.8		11.3	11.3		11.3	11.3	
Effective Green, g (s)	12.8	12.8		12.8	12.8		11.3	11.3		11.3	11.3	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.35	0.35		0.35	0.35	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	276	788		470	746		324	742		475	730	
v/s Ratio Prot		0.10			c0.24			0.09			c0.19	
v/s Ratio Perm	0.04			0.00			0.08			0.12		
v/c Ratio	0.10	0.26		0.01	0.61		0.24	0.26		0.34	0.53	
Uniform Delay, d1	6.0	6.5		5.8	7.7		7.4	7.4		7.7	8.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.0	1.5		0.4	0.2		0.4	0.8	
Delay (s)	6.2	6.7		5.8	9.2		7.7	7.6		8.1	9.1	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		6.6			9.1			7.6			8.8	
Approach LOS		A			A			A			A	

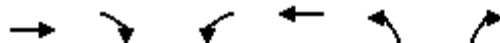
Intersection Summary

HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	32.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	670	123	443	612	0	205
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	807	148	534	737	0	247
Pedestrians	159			2	12	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	14			0	1	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.95	0.95	0.95	
vC, conflicting volume			819	2414	418	
vC1, stage 1 conf vol				819		
vC2, stage 2 conf vol				1595		
vCu, unblocked vol			709	2385	287	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)				5.8		
tF (s)			2.2	3.5	3.3	
p0 queue free %			37	100	63	
cM capacity (veh/h)			846	42	672	

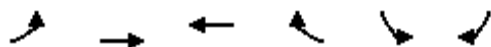
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	404	404	148	267	267	369	369	247
Volume Left	0	0	0	267	267	0	0	0
Volume Right	0	0	148	0	0	0	0	247
cSH	1700	1700	1700	846	846	1700	1700	672
Volume to Capacity	0.24	0.24	0.09	0.63	0.63	0.22	0.22	0.37
Queue Length 95th (m)	0.0	0.0	0.0	34.9	34.9	0.0	0.0	12.8
Control Delay (s)	0.0	0.0	0.0	16.2	16.2	0.0	0.0	13.4
Lane LOS				C	C	B		
Approach Delay (s)	0.0			6.8			13.4	
Approach LOS							B	

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

9: Hwy 97 On-ramp & Hwy 97 Ramp

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑	↗		↗
Volume (veh/h)	0	0	410	443	0	101
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	446	482	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	446				446	446
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	446				446	446
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	82
cM capacity (veh/h)	1115				570	613

Direction, Lane #	WB 1	WB 2	SB 1
Volume Total	446	482	110
Volume Left	0	0	0
Volume Right	0	482	110
cSH	1700	1700	613
Volume to Capacity	0.26	0.28	0.18
Queue Length 95th (m)	0.0	0.0	4.9
Control Delay (s)	0.0	0.0	12.2
Lane LOS			B
Approach Delay (s)	0.0		12.2
Approach LOS			B

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		34.5%	ICU Level of Service
Analysis Period (min)		15	A

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↑↔		↖	↑	↖	↖↗	↑	↖
Volume (vph)	159	409	264	724	556	192	178	216	254	337	13	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3517	3770	1687	3657	3598		1861	1984	1672	3657	1984	1676
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.51	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3517	3770	1687	3657	3598		992	1984	1672	3657	1984	1676
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	181	465	300	823	632	218	202	245	289	383	15	159
RTOR Reduction (vph)	0	0	153	0	38	0	0	0	23	0	0	119
Lane Group Flow (vph)	181	465	147	823	812	0	202	245	266	383	15	40
Confl. Peds. (#/hr)	14					14	7		4	4		7
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Prot		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4				2		2			6
Actuated Green, G (s)	7.1	15.6	39.3	16.1	24.6		31.6	20.5	36.6	7.1	3.9	11.0
Effective Green, g (s)	7.1	15.6	39.3	16.1	24.6		31.6	20.5	36.6	7.1	3.9	11.0
Actuated g/C Ratio	0.09	0.19	0.49	0.20	0.31		0.39	0.26	0.46	0.09	0.05	0.14
Clearance Time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	311	732	826	733	1102		647	507	762	323	96	230
v/s Ratio Prot	0.05	0.12	0.05	c0.23	c0.23		0.09	c0.12	0.07	c0.10	0.01	0.02
v/s Ratio Perm			0.03				0.03		0.09			0.01
v/c Ratio	0.58	0.64	0.18	1.12	0.74		0.31	0.48	0.35	1.19	0.16	0.17
Uniform Delay, d1	35.2	29.7	11.5	32.1	24.9		16.7	25.4	14.1	36.6	36.6	30.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.3	2.0	0.1	72.4	2.8		0.3	1.0	0.4	110.5	1.0	0.5
Delay (s)	38.4	31.8	11.6	104.5	27.7		16.9	26.4	14.5	147.1	37.7	31.1
Level of Service	D	C	B	F	C		B	C	B	F	D	C
Approach Delay (s)		26.6			65.5			19.1			111.0	
Approach LOS		C			E			B			F	

Intersection Summary

HCM Average Control Delay	53.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	80.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	113	95	55	170	23	143	67	13	72	27	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.98		1.00	0.98		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1888		1945	2110		2046	1803		1750	1622	
Flt Permitted	0.63	1.00		0.62	1.00		0.80	1.00		0.80	1.00	
Satd. Flow (perm)	1154	1888		1264	2110		1723	1803		1474	1622	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	123	103	60	185	25	155	73	14	78	29	113
RTOR Reduction (vph)	0	53	0	0	10	0	0	11	0	0	90	0
Lane Group Flow (vph)	32	173	0	60	200	0	155	76	0	78	52	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	2%	0%	0%	5%	0%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.1	12.1		12.1	12.1		5.0	5.0		5.0	5.0	
Effective Green, g (s)	12.1	12.1		12.1	12.1		5.0	5.0		5.0	5.0	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.20	0.20		0.20	0.20	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	556	910		609	1017		343	359		294	323	
v/s Ratio Prot		0.09			c0.09			0.04			0.03	
v/s Ratio Perm	0.03			0.05			c0.09			0.05		
v/c Ratio	0.06	0.19		0.10	0.20		0.45	0.21		0.27	0.16	
Uniform Delay, d1	3.5	3.7		3.5	3.7		8.8	8.4		8.5	8.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.1		0.1	0.1		0.9	0.3		0.5	0.2	
Delay (s)	3.5	3.8		3.6	3.8		9.8	8.7		9.0	8.5	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		3.8			3.8			9.4			8.7	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	25.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	38	76	813	28	221	719
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	83	884	30	240	782
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2161	899			914	
vC1, stage 1 conf vol	899					
vC2, stage 2 conf vol	1262					
vCu, unblocked vol	2161	899			914	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	74	76			68	
cM capacity (veh/h)	162	338			746	

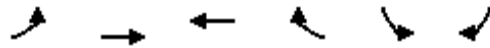
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	124	914	240	782
Volume Left	41	0	240	0
Volume Right	83	30	0	0
cSH	485	1700	746	1700
Volume to Capacity	0.26	0.54	0.32	0.46
Queue Length 95th (m)	7.7	0.0	10.6	0.0
Control Delay (s)	24.3	0.0	12.1	0.0
Lane LOS	C		B	
Approach Delay (s)	24.3	0.0	2.8	
Approach LOS	C			

Intersection Summary			
Average Delay		2.9	
Intersection Capacity Utilization		70.1%	ICU Level of Service C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	1397	802	87	0	65
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1518	872	95	0	71
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.89	
vC, conflicting volume	966				1678	265
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	966				1509	265
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	708				99	733

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	759	759	249	249	249	219	71
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	95	71
cSH	1700	1700	1700	1700	1700	1700	733
Volume to Capacity	0.45	0.45	0.15	0.15	0.15	0.13	0.10
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	2.4
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.4
Lane LOS							B
Approach Delay (s)	0.0		0.0				10.4
Approach LOS							B

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization	42.0%		ICU Level of Service A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	8	832	13	13	745
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	9	904	14	14	810
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1749	911			918	
vC1, stage 1 conf vol	911					
vC2, stage 2 conf vol	838					
vCu, unblocked vol	1749	911			918	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	97			98	
cM capacity (veh/h)	293	332			743	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	13	918	14	810
Volume Left	4	0	14	0
Volume Right	9	14	0	0
cSH	498	1700	743	1700
Volume to Capacity	0.03	0.54	0.02	0.48
Queue Length 95th (m)	0.6	0.0	0.4	0.0
Control Delay (s)	16.6	0.0	9.9	0.0
Lane LOS	C		A	
Approach Delay (s)	16.6	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		54.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	13	832	16	12	738
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	14	904	17	13	802
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL			TWLTL
Median storage veh			2			2
Upstream signal (m)			265			
pX, platoon unblocked	0.80	0.80			0.80	
vC, conflicting volume	1741	913			922	
vC1, stage 1 conf vol	913					
vC2, stage 2 conf vol	828					
vCu, unblocked vol	1800	770			781	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	96			98	
cM capacity (veh/h)	277	322			673	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	23	922	13	802
Volume Left	9	0	13	0
Volume Right	14	17	0	0
cSH	520	1700	673	1700
Volume to Capacity	0.04	0.54	0.02	0.47
Queue Length 95th (m)	1.0	0.0	0.5	0.0
Control Delay (s)	17.3	0.0	10.5	0.0
Lane LOS	C		B	
Approach Delay (s)	17.3	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		54.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28



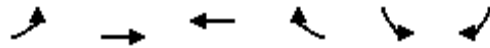
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕			↕	↕		↕	↕
Volume (veh/h)	61	692	48	63	732	80	45	0	73	68	0	74
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	752	52	68	796	87	49	0	79	74	0	80
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									4			4
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)		240			353							
pX, platoon unblocked	0.91			0.96			0.93	0.93	0.96	0.93	0.93	0.91
vC, conflicting volume	883			804			1446	1930	402	1485	1913	441
vC1, stage 1 conf vol							911	911		976	976	
vC2, stage 2 conf vol							535	1020		509	937	
vCu, unblocked vol	683			717			1150	1670	299	1192	1651	200
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			92			77	100	88	63	100	89
cM capacity (veh/h)	828			846			209	166	670	200	169	738

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	442	428	466	485	128	154
Volume Left	66	0	68	0	49	74
Volume Right	0	52	0	87	79	80
cSH	828	1700	846	1700	549	417
Volume to Capacity	0.08	0.25	0.08	0.29	0.23	0.37
Queue Length 95th (m)	2.0	0.0	2.0	0.0	6.8	12.8
Control Delay (s)	2.3	0.0	2.3	0.0	17.3	21.4
Lane LOS	A		A		C	C
Approach Delay (s)	1.2		1.1		17.3	21.4
Approach LOS					C	C

Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization		67.5%		ICU Level of Service		C
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
 37: Hwy 97 Ramp & RecPlace Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑			↗
Volume (veh/h)	0	0	224	0	0	629
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	243	0	0	684
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	243				243	243
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				243	243
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	14
cM capacity (veh/h)	1323				745	795

























Direction, Lane #	WB 1	SB 1
Volume Total	243	684
Volume Left	0	0
Volume Right	0	684
cSH	1700	795
Volume to Capacity	0.14	0.86
Queue Length 95th (m)	0.0	79.7
Control Delay (s)	0.0	30.4
Lane LOS		D
Approach Delay (s)	0.0	30.4
Approach LOS		D

Intersection Summary			
Average Delay		22.4	
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	484	1445	140	500	131	668	884	34	91	1430	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1727	3642	1821	1763	3573	1809	3467	3696	1523	1707	3599	1779
Flt Permitted	0.21	1.00	1.00	0.23	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	378	3642	1821	418	3573	1809	3467	3696	1523	1707	3599	1779
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	102	556	1661	161	575	151	768	1016	39	105	1644	67
RTOR Reduction (vph)	0	0	0	0	0	39	0	0	24	0	0	14
Lane Group Flow (vph)	102	556	1661	161	575	112	768	1016	15	105	1644	53
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	4%	3%	0%	3%	5%	0%	0%	1%	19%	3%	1%	0%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	35.6	29.6	140.7	35.6	29.6	62.1	23.4	46.5	52.5	32.5	55.0	61.0
Effective Green, g (s)	35.6	29.6	140.7	35.6	29.6	62.1	23.4	46.5	52.5	32.5	55.0	61.0
Actuated g/C Ratio	0.25	0.21	1.00	0.25	0.21	0.44	0.17	0.33	0.37	0.23	0.39	0.43
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	153	766	1821	163	752	798	577	1221	568	394	1407	771
v/s Ratio Prot	0.03	0.15		0.04	0.16	0.03	c0.22	0.27	0.00	0.06	c0.46	0.00
v/s Ratio Perm	0.14		c0.91	0.21		0.03			0.01			0.03
v/c Ratio	0.67	0.73	0.91	0.99	0.76	0.14	1.33	0.83	0.03	0.27	1.17	0.07
Uniform Delay, d1	43.9	51.8	0.0	51.0	52.3	23.4	58.6	43.5	27.9	44.3	42.8	23.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	4.2	8.5	66.2	5.5	0.1	160.6	5.0	0.0	0.4	83.8	0.0
Delay (s)	54.4	56.0	8.5	117.2	57.7	23.5	219.2	48.5	27.9	44.7	126.7	23.3
Level of Service	D	E	A	F	E	C	F	D	C	D	F	C
Approach Delay (s)		21.9			62.7			120.0			118.1	
Approach LOS		C			E			F			F	

Intersection Summary

HCM Average Control Delay	78.8	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	140.7	Sum of lost time (s)	14.2
Intersection Capacity Utilization	102.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↑↑	↗
Volume (veh/h)	0	260	65	1755	2184	844
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	280	70	1887	2348	908
Pedestrians				2	1	
Lane Width (m)				3.8	3.8	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.72					
vC, conflicting volume	3433	1176	2348			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3598	1176	2348			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	67			
cM capacity (veh/h)	2	187	212			

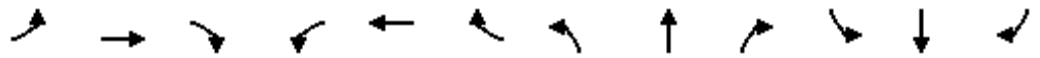
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	280	70	944	944	1174	1174	908
Volume Left	0	70	0	0	0	0	0
Volume Right	280	0	0	0	0	0	908
cSH	187	212	1700	1700	1700	1700	1700
Volume to Capacity	1.49	0.33	0.56	0.56	0.69	0.69	0.53
Queue Length 95th (m)	133.3	10.4	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	294.7	30.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	294.7	1.1			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		15.4	
Intersection Capacity Utilization	83.4%		ICU Level of Service E
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↑↑	↖	↖↗	↑↑	↖	↖	↑↑↑	↖
Volume (vph)	619	335	366	329	484	43	578	1021	266	81	1280	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3733	1604	3390	3450	1615	3390	3693	1812	1725	5250	1808
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	3236	3733	1604	3390	3450	1615	3390	3693	1812	253	5250	1808
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	696	376	411	370	544	48	649	1147	299	91	1438	933
RTOR Reduction (vph)	0	0	13	0	0	10	0	0	50	0	0	0
Lane Group Flow (vph)	696	376	398	370	544	38	649	1147	249	91	1438	933
Confl. Peds. (#/hr)			2	2			1					1
Heavy Vehicles (%)	1%	1%	0%	1%	0%	0%	1%	1%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	30.8	19.9	47.3	34.8	24.0	31.3	27.4	59.2	94.0	46.2	38.9	145.0
Effective Green, g (s)	30.8	19.9	47.3	34.8	24.0	31.3	27.4	59.2	94.0	46.2	38.9	145.0
Actuated g/C Ratio	0.21	0.14	0.33	0.24	0.17	0.22	0.19	0.41	0.65	0.32	0.27	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	687	512	523	814	571	349	641	1508	1175	155	1408	1808
v/s Ratio Prot	c0.22	0.10	0.14	0.11	c0.16	0.01	c0.19	0.31	0.05	0.03	c0.27	
v/s Ratio Perm			0.10			0.02			0.09	0.16		0.52
v/c Ratio	1.01	0.73	0.76	0.45	0.95	0.11	1.01	0.76	0.21	0.59	1.02	0.52
Uniform Delay, d1	57.1	60.0	43.8	47.0	59.9	45.6	58.8	36.8	10.4	36.8	53.0	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.6	5.4	6.4	0.4	26.2	0.1	38.7	2.7	0.1	5.6	29.5	1.1
Delay (s)	94.7	65.4	50.2	47.4	86.1	45.8	97.5	39.6	10.5	42.4	82.6	1.1
Level of Service	F	E	D	D	F	D	F	D	B	D	F	A
Approach Delay (s)		75.0			69.2			53.4			50.2	
Approach LOS		E			E			D			D	

Intersection Summary		
HCM Average Control Delay	59.0	HCM Level of Service E
HCM Volume to Capacity ratio	1.00	
Actuated Cycle Length (s)	145.0	Sum of lost time (s) 23.9
Intersection Capacity Utilization	91.9%	ICU Level of Service F
Analysis Period (min)	15	

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↓↓	↙
Volume (veh/h)	0	192	83	1590	1545	304
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	213	92	1767	1717	338
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2784	858	1717			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2784	858	1717			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	29	74			
cM capacity (veh/h)	12	302	361			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	213	92	883	883	858	858	338
Volume Left	0	92	0	0	0	0	0
Volume Right	213	0	0	0	0	0	338
cSH	302	361	1700	1700	1700	1700	1700
Volume to Capacity	0.71	0.26	0.52	0.52	0.50	0.50	0.20
Queue Length 95th (m)	37.9	7.6	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	41.2	18.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	C					
Approach Delay (s)	41.2	0.9			0.0		
Approach LOS	E						

Intersection Summary			
Average Delay		2.5	
Intersection Capacity Utilization	61.3%		ICU Level of Service B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	384	344	109	225	29	490	272	273	208	493	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1761	3507	1483	1734	3407		1745	3455	1723	1747	3455	
Flt Permitted	0.46	1.00	1.00	0.20	1.00		0.11	1.00	1.00	0.53	1.00	
Satd. Flow (perm)	848	3507	1483	366	3407		198	3455	1723	975	3455	
Peak-hour factor, PHF	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Adj. Flow (vph)	96	526	471	149	308	40	671	373	374	285	675	97
RTOR Reduction (vph)	0	0	20	0	7	0	0	0	63	0	8	0
Lane Group Flow (vph)	96	526	451	149	341	0	671	373	311	285	764	0
Confl. Peds. (#/hr)	14		11	11		14	5					5
Heavy Vehicles (%)	0%	1%	2%	0%	1%	0%	0%	1%	0%	1%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	32.2	26.2	72.2	36.2	28.2		83.1	61.5	69.5	46.7	31.1	
Effective Green, g (s)	32.2	26.2	72.2	36.2	28.2		83.1	61.5	69.5	46.7	31.1	
Actuated g/C Ratio	0.24	0.19	0.53	0.27	0.21		0.61	0.45	0.51	0.35	0.23	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	242	679	857	179	710		648	1570	961	426	794	
v/s Ratio Prot	0.02	0.15	0.18	c0.05	0.10		c0.35	0.11	0.02	0.08	0.22	
v/s Ratio Perm	0.08		0.13	c0.17			c0.28		0.16	0.15		
v/c Ratio	0.40	0.77	0.53	0.83	0.48		1.04	0.24	0.32	0.67	0.96	
Uniform Delay, d1	41.6	51.7	20.5	42.9	47.1		38.1	22.6	19.2	34.7	51.5	
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	1.1	5.8	0.6	26.8	0.7		44.8	0.1	0.2	4.0	23.2	
Delay (s)	42.7	57.6	21.1	69.7	47.8		82.9	22.7	19.4	38.7	74.7	
Level of Service	D	E	C	E	D		F	C	B	D	E	
Approach Delay (s)		40.5			54.4			50.3			65.0	
Approach LOS		D			D			D			E	

Intersection Summary

HCM Average Control Delay	52.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	135.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	77	436	11	74	435	490	20	447	160	331	343	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1723	3492		1736	3733	1797	1762	1817		1814	2048	
Flt Permitted	0.43	1.00		0.42	1.00	1.00	0.52	1.00		0.14	1.00	
Satd. Flow (perm)	788	3492		770	3733	1797	965	1817		261	2048	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	79	445	11	76	444	500	20	456	163	338	350	63
RTOR Reduction (vph)	0	2	0	0	0	121	0	18	0	0	9	0
Lane Group Flow (vph)	79	454	0	76	444	379	20	601	0	338	404	0
Confl. Peds. (#/hr)	6		5	5		6	4		6	6		4
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	14.6	14.6		14.6	14.6	25.5	24.3	24.3		40.2	40.2	
Effective Green, g (s)	14.6	14.6		14.6	14.6	25.5	24.3	24.3		40.2	40.2	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.38	0.36	0.36		0.60	0.60	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	172	763		168	816	686	351	661		410	1232	
v/s Ratio Prot		c0.13			0.12	0.09		c0.33		c0.13	0.20	
v/s Ratio Perm	0.10			0.10		0.12	0.02			0.36		
v/c Ratio	0.46	0.59		0.45	0.54	0.55	0.06	0.91		0.82	0.33	
Uniform Delay, d1	22.7	23.4		22.6	23.1	16.2	13.8	20.2		14.9	6.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	1.5		2.6	0.9	1.2	0.1	16.6		13.2	0.2	
Delay (s)	25.3	24.9		25.3	24.1	17.4	13.9	36.8		28.1	6.8	
Level of Service	C	C		C	C	B	B	D		C	A	
Approach Delay (s)		25.0			20.9			36.1			16.4	
Approach LOS		C			C			D			B	

Intersection Summary

HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	66.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	89.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	178	79	3	248	424	95	227	3	174	190	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.98	1.00	
Frt	1.00	0.95		1.00	0.91		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2044	2040		1922	1809		2056	2159		1981	2117	
Flt Permitted	0.23	1.00		0.59	1.00		0.62	1.00		0.59	1.00	
Satd. Flow (perm)	505	2040		1194	1809		1351	2159		1235	2117	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	33	191	85	3	267	456	102	244	3	187	204	10
RTOR Reduction (vph)	0	32	0	0	123	0	0	1	0	0	4	0
Lane Group Flow (vph)	33	244	0	3	600	0	102	246	0	187	210	0
Confl. Peds. (#/hr)	2		2	2		2			28	28		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.4	18.4		18.4	18.4		8.9	8.9		8.9	8.9	
Effective Green, g (s)	18.4	18.4		18.4	18.4		8.9	8.9		8.9	8.9	
Actuated g/C Ratio	0.52	0.52		0.52	0.52		0.25	0.25		0.25	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	263	1063		622	943		341	544		311	534	
v/s Ratio Prot		0.12			c0.33			0.11			0.10	
v/s Ratio Perm	0.07			0.00			0.08			c0.15		
v/c Ratio	0.13	0.23		0.00	0.64		0.30	0.45		0.60	0.39	
Uniform Delay, d1	4.3	4.6		4.1	6.1		10.7	11.1		11.6	11.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.1		0.0	1.4		0.5	0.6		3.3	0.5	
Delay (s)	4.5	4.7		4.1	7.5		11.2	11.7		14.9	11.4	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		4.7			7.5			11.6			13.0	
Approach LOS		A			A			B			B	

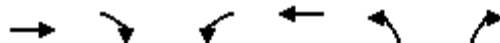
Intersection Summary

HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	35.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	709	183	575	434	0	308
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	771	199	625	472	0	335
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised		Raised			
Median storage veh	1		1			
Upstream signal (m)	207					
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			771		2257	385
vC1, stage 1 conf vol					771	
vC2, stage 2 conf vol					1486	
vCu, unblocked vol			593		2197	177
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			32		100	57
cM capacity (veh/h)			920		48	780

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	385	385	199	312	312	236	236	335
Volume Left	0	0	0	312	312	0	0	0
Volume Right	0	0	199	0	0	0	0	335
cSH	1700	1700	1700	920	920	1700	1700	780
Volume to Capacity	0.23	0.23	0.12	0.68	0.68	0.14	0.14	0.43
Queue Length 95th (m)	0.0	0.0	0.0	42.1	42.1	0.0	0.0	16.5
Control Delay (s)	0.0	0.0	0.0	16.8	16.8	0.0	0.0	13.0
Lane LOS				C	C	B		
Approach Delay (s)	0.0			9.6				13.0
Approach LOS								B

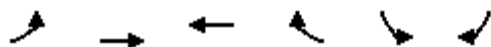
Intersection Summary

Average Delay	6.2	
Intersection Capacity Utilization	45.3%	ICU Level of Service A
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis

9: Hwy 97 On-ramp & Hwy 97 Ramp

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑	↗		↗
Volume (veh/h)	0	0	515	496	0	101
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	560	539	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	560				560	560
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	560				560	560
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	79
cM capacity (veh/h)	1011				490	528

Direction, Lane #	WB 1	WB 2	SB 1
Volume Total	560	539	110
Volume Left	0	0	0
Volume Right	0	539	110
cSH	1700	1700	528
Volume to Capacity	0.33	0.32	0.21
Queue Length 95th (m)	0.0	0.0	5.9
Control Delay (s)	0.0	0.0	13.6
Lane LOS			B
Approach Delay (s)	0.0		13.6
Approach LOS			B

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization	40.0%		ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	238	435	355	984	641	289	219	286	320	451	21	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3657	3733	1670	3657	3595		1884	1984	1678	3657	1984	1674
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.60	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3657	3733	1670	3657	3595		1182	1984	1678	3657	1984	1674
Peak-hour factor, PHF	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Adj. Flow (vph)	313	572	467	1295	843	380	288	376	421	593	28	346
RTOR Reduction (vph)	0	0	234	0	40	0	0	0	2	0	0	97
Lane Group Flow (vph)	313	572	233	1295	1183	0	288	376	419	593	28	249
Confl. Peds. (#/hr)			7	7			1		1	1		1
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4				2		2			6
Actuated Green, G (s)	14.0	19.0	51.1	43.0	48.0		52.8	28.8	71.8	20.0	16.7	30.7
Effective Green, g (s)	14.0	19.0	51.1	43.0	48.0		52.8	28.8	71.8	20.0	16.7	30.7
Actuated g/C Ratio	0.11	0.14	0.39	0.33	0.36		0.40	0.22	0.54	0.15	0.13	0.23
Clearance Time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	388	538	647	1193	1309		644	434	914	555	251	390
v/s Ratio Prot	0.09	c0.15	0.09	c0.35	0.33		0.11	c0.19	0.15	c0.16	0.01	0.07
v/s Ratio Perm			0.05				0.07		0.10			0.08
v/c Ratio	0.81	1.06	0.36	1.09	0.90		0.45	0.87	0.46	1.07	0.11	0.64
Uniform Delay, d1	57.6	56.4	28.7	44.4	39.7		28.0	49.6	18.2	55.9	51.0	45.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.2	56.7	0.3	52.5	9.2		0.5	16.9	0.5	57.8	0.3	3.9
Delay (s)	69.8	113.1	29.1	96.9	48.9		28.5	66.5	18.7	113.7	51.2	49.4
Level of Service	E	F	C	F	D		C	E	B	F	D	D
Approach Delay (s)		74.0			73.6			37.9			88.9	
Approach LOS		E			E			D			F	

Intersection Summary

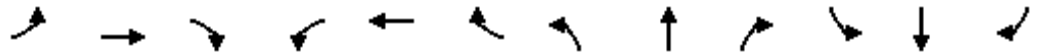
HCM Average Control Delay	69.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	131.8	Sum of lost time (s)	21.0
Intersection Capacity Utilization	86.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Volume (vph)	42	140	192	28	259	34	311	96	31	91	35	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.98		1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1840		2037	2114		2046	1779		1750	1623	
Flt Permitted	0.51	1.00		0.44	1.00		0.64	1.00		0.67	1.00	
Satd. Flow (perm)	939	1840		954	2114		1383	1779		1229	1623	
Peak-hour factor, PHF	0.92	0.84	0.84	0.84	0.84	0.92	0.84	0.92	0.84	0.92	0.92	0.92
Adj. Flow (vph)	46	167	229	33	308	37	370	104	37	99	38	145
RTOR Reduction (vph)	0	131	0	0	11	0	0	22	0	0	88	0
Lane Group Flow (vph)	46	265	0	33	334	0	370	119	0	99	95	0
Confl. Peds. (#/hr)			8	8								
Heavy Vehicles (%)	2%	0%	0%	0%	0%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.0	12.0		12.0	12.0		12.9	12.9		12.9	12.9	
Effective Green, g (s)	12.0	12.0		12.0	12.0		12.9	12.9		12.9	12.9	
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.39	0.39		0.39	0.39	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	342	671		348	771		542	698		482	636	
v/s Ratio Prot		0.14			c0.16			0.07			0.06	
v/s Ratio Perm	0.05			0.03			c0.27			0.08		
v/c Ratio	0.13	0.40		0.09	0.43		0.68	0.17		0.21	0.15	
Uniform Delay, d1	7.0	7.8		6.9	7.9		8.3	6.5		6.6	6.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.1	0.4		3.5	0.1		0.2	0.1	
Delay (s)	7.2	8.1		7.0	8.3		11.8	6.6		6.8	6.6	
Level of Service	A	A		A	A		B	A		A	A	
Approach Delay (s)		8.0			8.2			10.4			6.7	
Approach LOS		A			A			B			A	

Intersection Summary

HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	32.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	46	95	987	36	299	692
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)	50	103	1073	39	325	752
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2495	1092			1112	
vC1, stage 1 conf vol	1092					
vC2, stage 2 conf vol	1402					
vCu, unblocked vol	2495	1092			1112	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	50	60			48	
cM capacity (veh/h)	101	261			628	

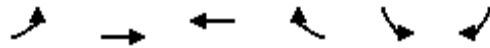
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	153	1112	325	752
Volume Left	50	0	325	0
Volume Right	103	39	0	0
cSH	310	1700	628	1700
Volume to Capacity	0.50	0.65	0.52	0.44
Queue Length 95th (m)	19.7	0.0	22.7	0.0
Control Delay (s)	41.9	0.0	16.7	0.0
Lane LOS	E		C	
Approach Delay (s)	41.9	0.0	5.0	
Approach LOS	E			

Intersection Summary				
Average Delay		5.1		
Intersection Capacity Utilization		84.0%	ICU Level of Service	E
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	1320	798	135	0	93
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1435	867	147	0	101
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.86	
vC, conflicting volume	1014				1658	290
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1014				1438	290
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	86
cM capacity (veh/h)	680				106	706

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	717	717	248	248	248	271	101
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	147	101
cSH	1700	1700	1700	1700	1700	1700	706
Volume to Capacity	0.42	0.42	0.15	0.15	0.15	0.16	0.14
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	3.8
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.9
Lane LOS							B
Approach Delay (s)	0.0		0.0				10.9
Approach LOS							B

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		39.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	13	1010	12	11	726
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	14	1098	13	12	789
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1917	1104			1111	
vC1, stage 1 conf vol	1104					
vC2, stage 2 conf vol	813					
vCu, unblocked vol	1917	1104			1111	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	94			98	
cM capacity (veh/h)	257	257			629	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	21	1111	12	789
Volume Left	7	0	12	0
Volume Right	14	13	0	0
cSH	375	1700	629	1700
Volume to Capacity	0.06	0.65	0.02	0.46
Queue Length 95th (m)	1.3	0.0	0.4	0.0
Control Delay (s)	19.7	0.0	10.8	0.0
Lane LOS	C		B	
Approach Delay (s)	19.7	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	12	21	1001	13	10	723
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	23	1088	14	11	786
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)			265			
pX, platoon unblocked	0.76	0.76			0.76	
vC, conflicting volume	1903	1095			1102	
vC1, stage 1 conf vol	1095					
vC2, stage 2 conf vol	808					
vCu, unblocked vol	2033	964			974	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	90			98	
cM capacity (veh/h)	230	234			535	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	36	1102	11	786
Volume Left	13	0	11	0
Volume Right	23	14	0	0
cSH	368	1700	535	1700
Volume to Capacity	0.10	0.65	0.02	0.46
Queue Length 95th (m)	2.4	0.0	0.5	0.0
Control Delay (s)	21.9	0.0	11.9	0.0
Lane LOS	C		B	
Approach Delay (s)	21.9	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		63.5%	ICU Level of Service B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28

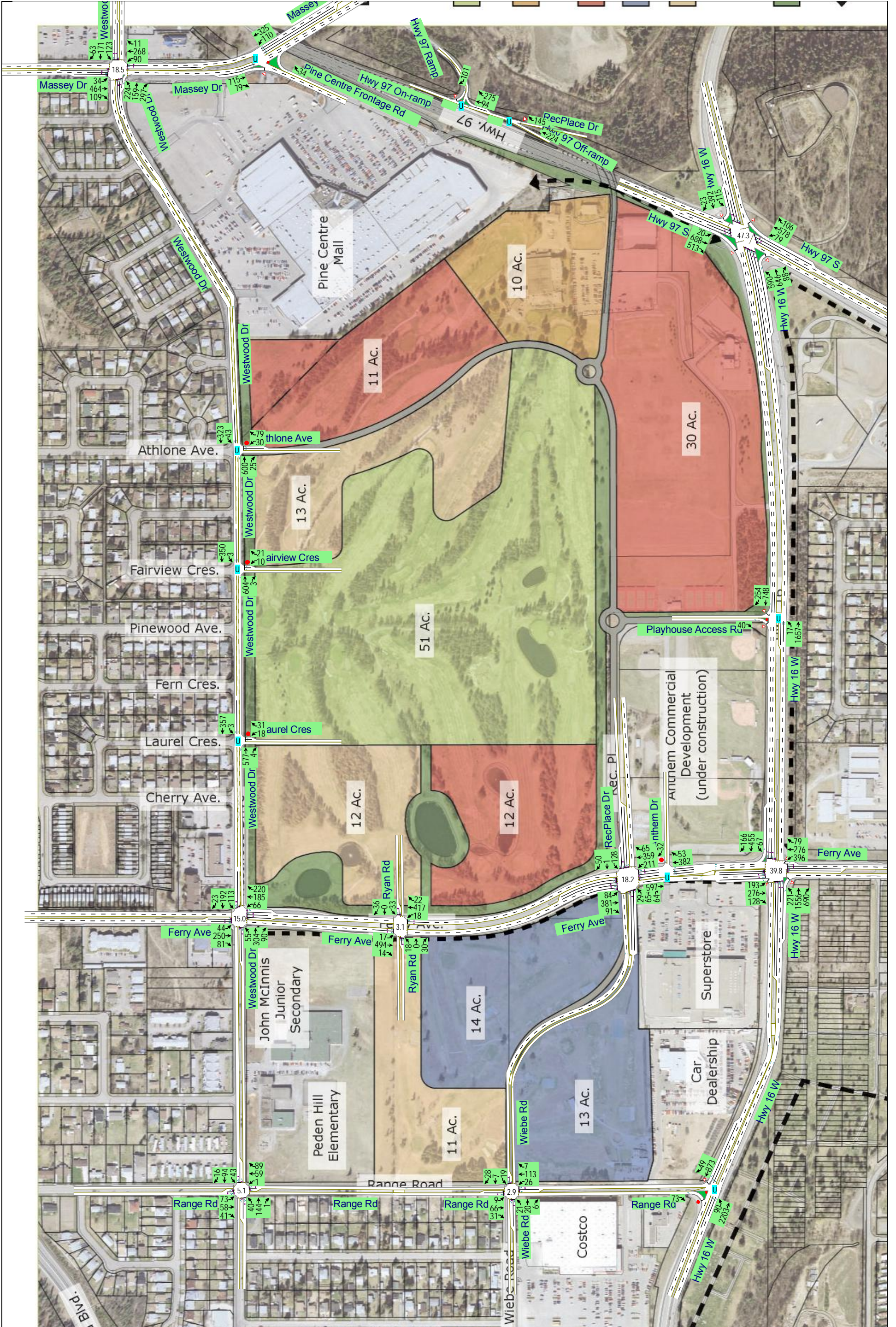


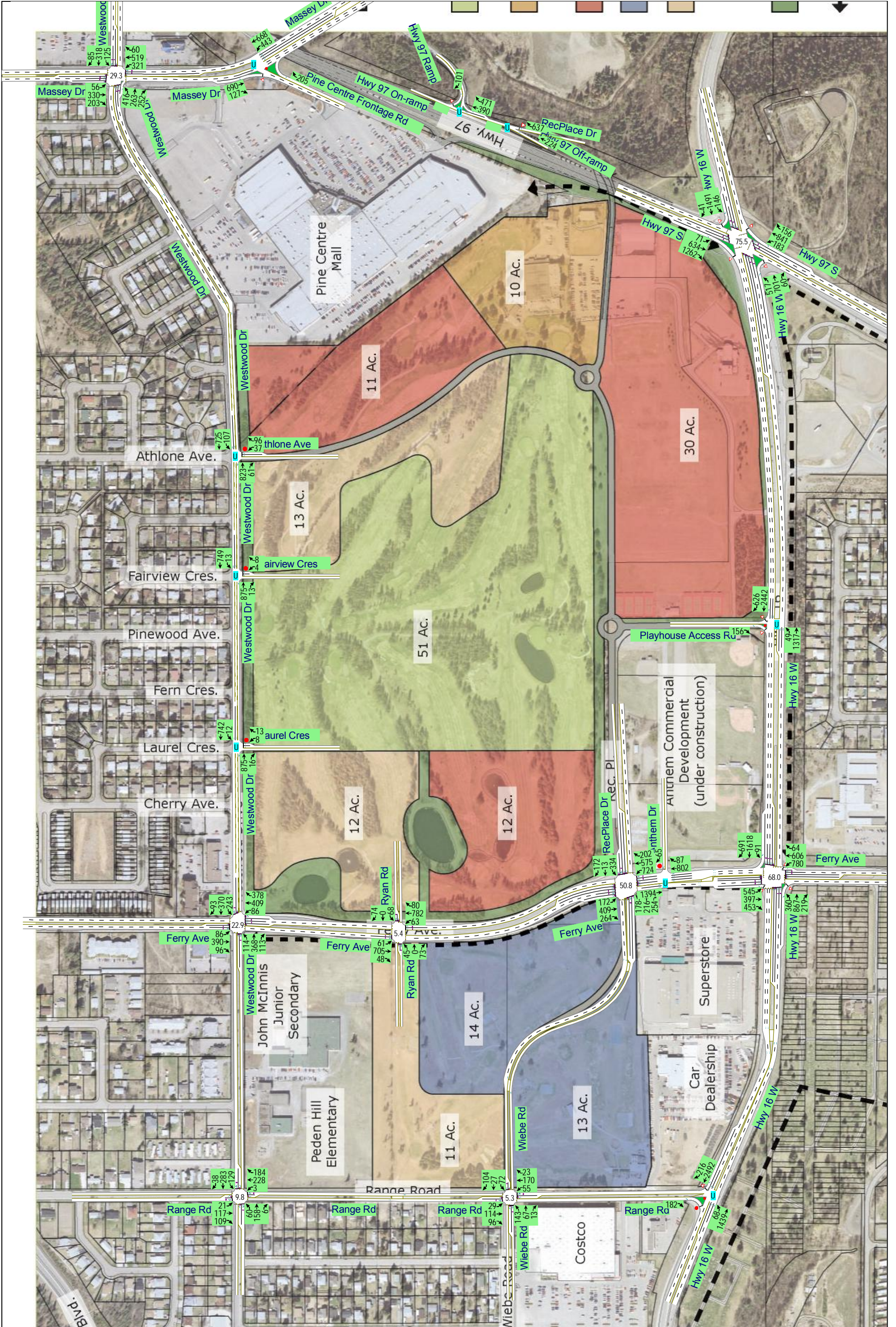
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔			↕	↗		↕	↗
Volume (veh/h)	75	845	62	82	942	99	58	0	95	88	0	97
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	918	67	89	1024	108	63	0	103	96	0	105
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									4			4
Median type		Raised			Raised							
Median storage veh		1			1							
Upstream signal (m)		240			353							
pX, platoon unblocked	0.89			0.93			0.93	0.93	0.93	0.93	0.93	0.89
vC, conflicting volume	1132			986			1805	2425	493	1878	2405	566
vC1, stage 1 conf vol							1115	1115		1256	1256	
vC2, stage 2 conf vol							690	1310		622	1149	
vCu, unblocked vol	904			829			1362	2030	298	1440	2008	269
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	88			88			57	100	84	28	100	84
cM capacity (veh/h)	667			741			148	101	648	133	109	650

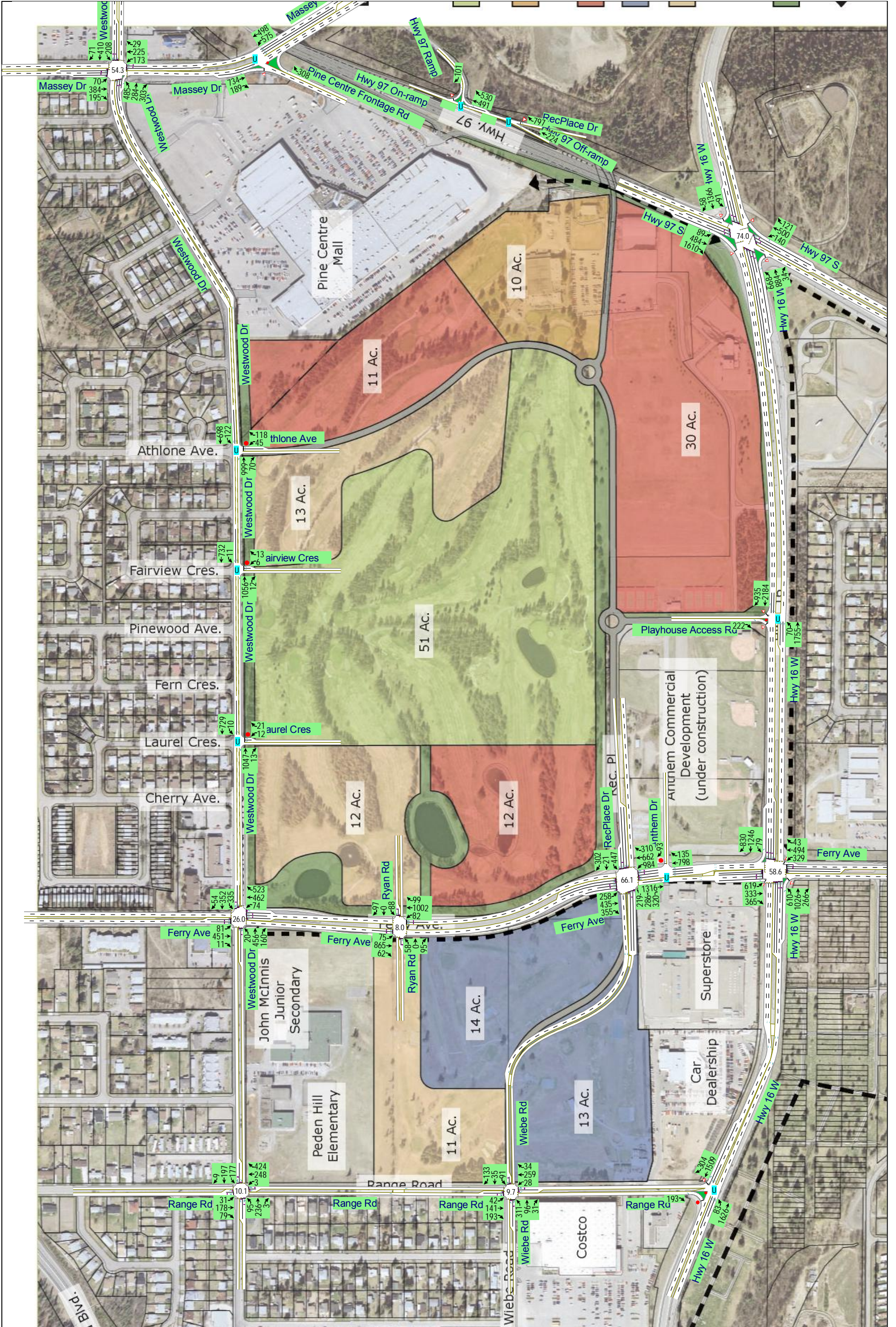
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	541	527	601	620	166	201
Volume Left	82	0	89	0	63	96
Volume Right	0	67	0	108	103	105
cSH	667	1700	741	1700	389	279
Volume to Capacity	0.12	0.31	0.12	0.36	0.43	0.72
Queue Length 95th (m)	3.2	0.0	3.1	0.0	15.8	38.7
Control Delay (s)	3.3	0.0	3.1	0.0	24.8	45.3
Lane LOS	A		A		C	E
Approach Delay (s)	1.7		1.5		24.8	45.3
Approach LOS					C	E

Intersection Summary		
Average Delay		6.4
Intersection Capacity Utilization	80.6%	ICU Level of Service D
Analysis Period (min)		15

Intersection Sign configuration not allowed in HCM analysis.







HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑	↗	↘↗	↑↑	↗	↘	↑↑	↗
Volume (vph)	20	688	513	79	578	106	590	646	88	115	392	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1694	3539	1686	1713	3506	1735	3366	3624	1644	1724	3564	1670
Flt Permitted	0.32	1.00	1.00	0.18	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	574	3539	1686	331	3506	1735	3366	3624	1644	1724	3564	1670
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	23	782	583	90	657	120	670	734	100	131	445	26
RTOR Reduction (vph)	0	0	0	0	0	65	0	0	61	0	0	20
Lane Group Flow (vph)	23	782	583	90	657	55	670	734	39	131	445	6
Confl. Peds. (#/hr)	1					1	9		2	2		9
Heavy Vehicles (%)	6%	6%	8%	6%	7%	4%	3%	3%	9%	2%	2%	6%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	35.1	31.8	102.4	40.7	34.6	47.0	16.6	26.0	32.1	12.4	21.2	24.5
Effective Green, g (s)	35.1	31.8	102.4	40.7	34.6	47.0	16.6	26.0	32.1	12.4	21.2	24.5
Actuated g/C Ratio	0.34	0.31	1.00	0.40	0.34	0.46	0.16	0.25	0.31	0.12	0.21	0.24
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	233	1099	1686	214	1185	796	546	920	515	209	738	400
v/s Ratio Prot	0.00	c0.22		0.03	0.19	0.01	c0.20	0.20	0.00	0.08	c0.12	0.00
v/s Ratio Perm	0.03		c0.35	0.14		0.02			0.02			0.00
v/c Ratio	0.10	0.71	0.35	0.42	0.55	0.07	1.23	0.80	0.08	0.63	0.60	0.02
Uniform Delay, d1	22.6	31.2	0.0	21.2	27.6	15.5	42.9	35.7	24.7	42.8	36.8	29.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	2.7	0.6	1.3	1.0	0.0	117.7	4.9	0.1	5.8	1.4	0.0
Delay (s)	22.8	34.0	0.6	22.5	28.6	15.5	160.6	40.6	24.8	48.6	38.2	29.8
Level of Service	C	C	A	C	C	B	F	D	C	D	D	C
Approach Delay (s)		19.8			26.1			93.0			40.1	
Approach LOS		B			C			F			D	

Intersection Summary

HCM Average Control Delay	49.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	102.4	Sum of lost time (s)	21.2
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	40	17	1657	748	254
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	48	20	1973	890	302
Pedestrians					3	
Lane Width (m)					3.4	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.55					
vC, conflicting volume	2071	448	890			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1308	448	890			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	92	97			
cM capacity (veh/h)	82	564	770			

























Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	48	20	986	986	356	356	480
Volume Left	0	20	0	0	0	0	0
Volume Right	48	0	0	0	0	0	302
cSH	564	770	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.03	0.58	0.58	0.21	0.21	0.28
Queue Length 95th (m)	2.1	0.6	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.0	9.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	12.0	0.1			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization	49.1%		ICU Level of Service A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	193	276	128	396	276	79	221	1556	690	67	455	166
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3697	1583	3292	3450	1568	3424	3622	1830	1675	5148	1808
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	3236	3697	1583	3292	3450	1568	3424	3622	1830	145	5148	1808
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	210	300	139	430	300	86	240	1691	750	73	495	180
RTOR Reduction (vph)	0	0	106	0	0	18	0	0	69	0	0	0
Lane Group Flow (vph)	210	300	33	430	300	68	240	1691	681	73	495	180
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	2%	2%	4%	0%	3%	0%	3%	0%	3%	3%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	12.1	14.7	27.4	16.8	19.5	25.5	12.7	55.4	72.2	54.5	48.5	116.7
Effective Green, g (s)	12.1	14.7	27.4	16.8	19.5	25.5	12.7	55.4	72.2	54.5	48.5	116.7
Actuated g/C Ratio	0.10	0.13	0.23	0.14	0.17	0.22	0.11	0.47	0.62	0.47	0.42	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	336	466	372	474	576	343	373	1719	1132	146	2139	1808
v/s Ratio Prot	0.06	c0.08	0.01	c0.13	0.09	0.01	c0.07	c0.47	0.09	0.03	0.10	
v/s Ratio Perm			0.01			0.03			0.29	0.21		c0.10
v/c Ratio	0.62	0.64	0.09	0.91	0.52	0.20	0.64	0.98	0.60	0.50	0.23	0.10
Uniform Delay, d1	50.1	48.5	34.9	49.2	44.3	37.3	49.8	30.2	13.5	26.2	22.0	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	3.0	0.1	20.8	0.9	0.3	3.8	18.0	0.9	2.7	0.1	0.1
Delay (s)	53.7	51.6	35.0	70.0	45.2	37.5	53.6	48.2	14.4	28.9	22.2	0.1
Level of Service	D	D	C	E	D	D	D	D	B	C	C	A
Approach Delay (s)		48.7			57.5			39.2			17.5	
Approach LOS		D			E			D			B	
Intersection Summary												
HCM Average Control Delay			40.2				HCM Level of Service			D		
HCM Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			116.7				Sum of lost time (s)		24.0			
Intersection Capacity Utilization			86.4%				ICU Level of Service		E			
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↘
Volume (veh/h)	0	73	90	2203	873	49
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	78	96	2344	929	52
Pedestrians				1		
Lane Width (m)				3.7		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2292	465	929			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2292	465	929			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	86	87			
cM capacity (veh/h)	29	549	732			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	78	96	1172	1172	464	464	52
Volume Left	0	96	0	0	0	0	0
Volume Right	78	0	0	0	0	0	52
cSH	549	732	1700	1700	1700	1700	1700
Volume to Capacity	0.14	0.13	0.69	0.69	0.27	0.27	0.03
Queue Length 95th (m)	3.7	3.4	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.6	10.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B					
Approach Delay (s)	12.6	0.4			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		71.2%	ICU Level of Service C
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	464	109	90	268	11	224	159	297	123	171	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3542	1478	1734	3489		1726	3421	1703	1761	3314	
Flt Permitted	0.57	1.00	1.00	0.34	1.00		0.46	1.00	1.00	0.64	1.00	
Satd. Flow (perm)	986	3542	1478	619	3489		838	3421	1703	1191	3314	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	504	118	98	291	12	243	173	323	134	186	68
RTOR Reduction (vph)	0	0	71	0	3	0	0	0	133	0	45	0
Lane Group Flow (vph)	37	504	47	98	300	0	243	173	190	134	209	0
Confl. Peds. (#/hr)	7		10	10		7	5		5	5		5
Heavy Vehicles (%)	7%	0%	2%	0%	0%	0%	1%	2%	0%	0%	1%	4%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	21.9	19.7	27.8	29.5	23.5		23.3	15.2	21.2	16.5	11.8	
Effective Green, g (s)	21.9	19.7	27.8	29.5	23.5		23.3	15.2	21.2	16.5	11.8	
Actuated g/C Ratio	0.31	0.28	0.40	0.42	0.34		0.33	0.22	0.30	0.24	0.17	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	331	1003	718	358	1178		384	747	666	321	562	
v/s Ratio Prot	0.00	c0.14	0.01	0.02	c0.09		c0.07	0.05	c0.02	0.03	0.06	
v/s Ratio Perm	0.03		0.02	0.09			c0.14		0.09	0.07		
v/c Ratio	0.11	0.50	0.07	0.27	0.25		0.63	0.23	0.29	0.42	0.37	
Uniform Delay, d1	16.7	20.9	12.9	12.6	16.7		18.0	22.4	18.4	21.9	25.6	
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	0.2	0.5	0.0	0.4	0.2		3.4	0.2	0.2	0.9	0.6	
Delay (s)	16.9	21.4	12.9	13.0	16.9		21.4	22.6	18.7	22.8	26.2	
Level of Service	B	C	B	B	B		C	C	B	C	C	
Approach Delay (s)		19.6			15.9			20.5			25.0	
Approach LOS		B			B			C			C	

Intersection Summary

HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	69.6	Sum of lost time (s)	24.0
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	44	250	81	66	185	220	55	304	90	113	192	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.97	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		0.99	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3325		1719	3697	1743	1740	1793		1759	2060	
Flt Permitted	0.62	1.00		0.53	1.00	1.00	0.61	1.00		0.27	1.00	
Satd. Flow (perm)	1108	3325		953	3697	1743	1109	1793		507	2060	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	51	287	93	76	213	253	63	349	103	130	221	26
RTOR Reduction (vph)	0	51	0	0	0	168	0	18	0	0	7	0
Lane Group Flow (vph)	51	329	0	76	213	85	63	434	0	130	240	0
Confl. Peds. (#/hr)	15		16	16		15	30		20	20		30
Heavy Vehicles (%)	0%	0%	2%	0%	2%	2%	0%	2%	1%	3%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	11.9	11.9		11.9	11.9	18.0	18.6	18.6		29.7	29.7	
Effective Green, g (s)	11.9	11.9		11.9	11.9	18.0	18.6	18.6		29.7	29.7	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.34	0.35	0.35		0.55	0.55	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	246	738		212	821	585	385	622		423	1141	
v/s Ratio Prot		c0.10			0.06	0.02		c0.24		c0.03	0.12	
v/s Ratio Perm	0.05			0.08		0.03	0.06			0.14		
v/c Ratio	0.21	0.45		0.36	0.26	0.15	0.16	0.70		0.31	0.21	
Uniform Delay, d1	17.0	18.0		17.6	17.2	12.4	12.1	15.1		7.0	6.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.6		1.4	0.2	0.2	0.3	3.7		0.6	0.1	
Delay (s)	17.6	18.6		19.0	17.4	12.6	12.4	18.8		7.6	6.2	
Level of Service	B	B		B	B	B	B	B		A	A	
Approach Delay (s)		18.5			15.4			18.0			6.6	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	53.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	64.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	73	58	41	1	59	89	40	144	1	43	94	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		0.99	1.00		0.97	1.00	
Frt	1.00	0.94		1.00	0.91		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2006	1995		1925	1753		1983	2161		1898	2078	
Flt Permitted	0.65	1.00		0.68	1.00		0.89	1.00		0.89	1.00	
Satd. Flow (perm)	1372	1995		1385	1753		1856	2161		1776	2078	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	84	67	47	1	68	102	46	166	1	49	108	18
RTOR Reduction (vph)	0	24	0	0	53	0	0	1	0	0	15	0
Lane Group Flow (vph)	84	90	0	1	117	0	46	166	0	49	111	0
Confl. Peds. (#/hr)	33					33	10		42	42		10
Heavy Vehicles (%)	0%	0%	3%	0%	0%	4%	3%	0%	0%	4%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.6	11.6		11.6	11.6		4.5	4.5		4.5	4.5	
Effective Green, g (s)	11.6	11.6		11.6	11.6		4.5	4.5		4.5	4.5	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.19	0.19		0.19	0.19	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	660	960		667	844		347	404		332	388	
v/s Ratio Prot		0.04			c0.07			c0.08			0.05	
v/s Ratio Perm	0.06			0.00			0.02			0.03		
v/c Ratio	0.13	0.09		0.00	0.14		0.13	0.41		0.15	0.29	
Uniform Delay, d1	3.5	3.4		3.2	3.5		8.2	8.6		8.2	8.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.0		0.0	0.1		0.2	0.7		0.2	0.4	
Delay (s)	3.5	3.4		3.2	3.5		8.3	9.3		8.4	8.8	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		3.5			3.5			9.1			8.7	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	24.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	715	79	110	325	0	34
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	883	98	136	401	0	42
Pedestrians	90			5	5	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	8			0	0	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.92		0.92	0.92
vC, conflicting volume			888		1450	451
vC1, stage 1 conf vol					888	
vC2, stage 2 conf vol					562	
vCu, unblocked vol			716		1324	244
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			83		100	94
cM capacity (veh/h)			816		238	699

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	441	441	98	68	68	201	201	42
Volume Left	0	0	0	68	68	0	0	0
Volume Right	0	0	98	0	0	0	0	42
cSH	1700	1700	1700	816	816	1700	1700	699
Volume to Capacity	0.26	0.26	0.06	0.17	0.17	0.12	0.12	0.06
Queue Length 95th (m)	0.0	0.0	0.0	4.5	4.5	0.0	0.0	1.5
Control Delay (s)	0.0	0.0	0.0	10.3	10.3	0.0	0.0	10.5
Lane LOS				B	B	B		
Approach Delay (s)	0.0			2.6			10.5	
Approach LOS							B	

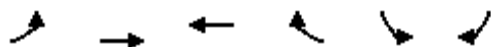
Intersection Summary

Average Delay	1.2	
Intersection Capacity Utilization	38.0%	ICU Level of Service A
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis

9: Hwy 97 On-ramp & Hwy 97 Ramp

2008/10/28

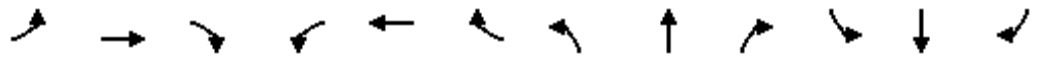


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑	↗		↗
Volume (veh/h)	0	0	94	275	0	101
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	102	299	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	102				102	102
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	102				102	102
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	88
cM capacity (veh/h)	1490				896	953
Direction, Lane #	WB 1	WB 2	SB 1			
Volume Total	102	299	110			
Volume Left	0	0	0			
Volume Right	0	299	110			
cSH	1700	1700	953			
Volume to Capacity	0.06	0.18	0.12			
Queue Length 95th (m)	0.0	0.0	3.0			
Control Delay (s)	0.0	0.0	9.3			
Lane LOS			A			
Approach Delay (s)	0.0		9.3			
Approach LOS			A			
Intersection Summary						
Average Delay			2.0			
Intersection Capacity Utilization			20.4%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	84	381	91	211	359	65	29	65	64	128	1	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3657	3733	1670	3621	3644		1885	1984	1118	3657	1984	1677
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.58	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3657	3733	1670	3621	3644		1150	1984	1118	3657	1984	1677
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	105	476	114	264	449	81	36	81	80	160	1	62
RTOR Reduction (vph)	0	0	66	0	17	0	0	0	48	0	0	53
Lane Group Flow (vph)	105	476	48	264	513	0	36	81	32	160	1	9
Confl. Peds. (#/hr)	5		5	5		5	1		2	2		1
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	0%	50%	0%	0%	0%
Turn Type	Prot		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4				2		2			6
Actuated Green, G (s)	4.7	14.9	24.2	8.3	18.5		16.2	6.9	15.2	6.4	4.0	8.7
Effective Green, g (s)	4.7	14.9	24.2	8.3	18.5		16.2	6.9	15.2	6.4	4.0	8.7
Actuated g/C Ratio	0.08	0.26	0.42	0.14	0.32		0.28	0.12	0.26	0.11	0.07	0.15
Clearance Time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	299	967	703	523	1172		443	238	296	407	138	254
v/s Ratio Prot	0.03	0.13	0.01	c0.07	c0.14		0.01	c0.04	0.02	c0.04	0.00	0.00
v/s Ratio Perm			0.02				0.01		0.01			0.00
v/c Ratio	0.35	0.49	0.07	0.50	0.44		0.08	0.34	0.11	0.39	0.01	0.04
Uniform Delay, d1	25.0	18.1	9.9	22.7	15.4		15.2	23.2	16.0	23.7	24.9	20.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.5	0.0	1.0	0.4		0.1	1.2	0.2	0.6	0.0	0.1
Delay (s)	25.9	18.6	10.0	23.8	15.8		15.3	24.4	16.2	24.4	24.9	20.9
Level of Service	C	B	A	C	B		B	C	B	C	C	C
Approach Delay (s)		18.3			18.4			19.4			23.4	
Approach LOS		B			B			B			C	

Intersection Summary

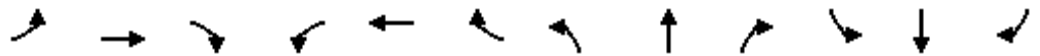
HCM Average Control Delay	19.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	57.5	Sum of lost time (s)	21.0
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	9	66	31	26	113	7	21	20	6	19	7	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1934		2040	2113		2043	1784		1750	1624	
Flt Permitted	0.66	1.00		0.68	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (perm)	1223	1934		1463	2113		2150	1784		1842	1624	
Peak-hour factor, PHF	0.92	0.82	0.82	0.82	0.82	0.92	0.82	0.92	0.82	0.92	0.92	0.92
Adj. Flow (vph)	10	80	38	32	138	8	26	22	7	21	8	30
RTOR Reduction (vph)	0	14	0	0	3	0	0	7	0	0	29	0
Lane Group Flow (vph)	10	104	0	32	143	0	26	22	0	21	10	0
Confl. Peds. (#/hr)			4	4			2					
Heavy Vehicles (%)	2%	0%	0%	0%	1%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.7	16.7		16.7	16.7		1.3	1.3		1.3	1.3	
Effective Green, g (s)	16.7	16.7		16.7	16.7		1.3	1.3		1.3	1.3	
Actuated g/C Ratio	0.64	0.64		0.64	0.64		0.05	0.05		0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	786	1242		940	1357		108	89		92	81	
v/s Ratio Prot		0.05			c0.07			c0.01			0.01	
v/s Ratio Perm	0.01			0.02			0.01			0.01		
v/c Ratio	0.01	0.08		0.03	0.11		0.24	0.25		0.23	0.12	
Uniform Delay, d1	1.7	1.8		1.7	1.8		11.9	11.9		11.9	11.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.0		1.2	1.5		1.3	0.6	
Delay (s)	1.7	1.8		1.7	1.8		13.0	13.4		13.1	12.5	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		1.8			1.8			13.2			12.7	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	4.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	26.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	30	79	600	25	43	323
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)	33	86	652	27	47	351
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			TWLTL			TWLTL
Median storage veh			2			2
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1110	666			679	
vC1, stage 1 conf vol	666					
vC2, stage 2 conf vol	445					
vCu, unblocked vol	1110	666			679	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	81			95	
cM capacity (veh/h)	431	460			913	

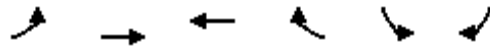
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	118	679	47	351
Volume Left	33	0	47	0
Volume Right	86	27	0	0
cSH	634	1700	913	1700
Volume to Capacity	0.19	0.40	0.05	0.21
Queue Length 95th (m)	5.2	0.0	1.2	0.0
Control Delay (s)	14.5	0.0	9.2	0.0
Lane LOS	B		A	
Approach Delay (s)	14.5	0.0	1.1	
Approach LOS	B			

Intersection Summary			
Average Delay		1.8	
Intersection Capacity Utilization		45.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	597	382	53	0	32
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	649	415	58	0	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.90	
vC, conflicting volume	473				768	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	473				525	133
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	96
cM capacity (veh/h)	1085				435	892

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	324	324	119	119	119	117	35
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	58	35
cSH	1700	1700	1700	1700	1700	1700	892
Volume to Capacity	0.19	0.19	0.07	0.07	0.07	0.07	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	9.2
Lane LOS							A
Approach Delay (s)	0.0		0.0				9.2
Approach LOS							A

Intersection Summary							
Average Delay			0.3				
Intersection Capacity Utilization			19.8%		ICU Level of Service		A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	21	604	3	3	350
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	23	657	3	3	380
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1045	658			660	
vC1, stage 1 conf vol	658					
vC2, stage 2 conf vol	387					
vCu, unblocked vol	1045	658			660	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	95			100	
cM capacity (veh/h)	455	464			928	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	34	660	3	380
Volume Left	11	0	3	0
Volume Right	23	3	0	0
cSH	685	1700	928	1700
Volume to Capacity	0.05	0.39	0.00	0.22
Queue Length 95th (m)	1.2	0.0	0.1	0.0
Control Delay (s)	13.1	0.0	8.9	0.0
Lane LOS	B		A	
Approach Delay (s)	13.1	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		42.0%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	18	31	577	4	3	357
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	34	627	4	3	388
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)			265			
pX, platoon unblocked	0.91	0.91			0.91	
vC, conflicting volume	1024	629			632	
vC1, stage 1 conf vol	629					
vC2, stage 2 conf vol	395					
vCu, unblocked vol	976	543			545	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	93			100	
cM capacity (veh/h)	462	491			931	

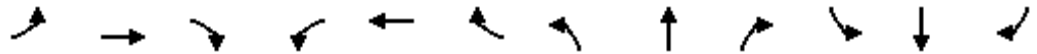
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	53	632	3	388
Volume Left	20	0	3	0
Volume Right	34	4	0	0
cSH	776	1700	931	1700
Volume to Capacity	0.07	0.37	0.00	0.23
Queue Length 95th (m)	1.7	0.0	0.1	0.0
Control Delay (s)	13.0	0.0	8.9	0.0
Lane LOS	B		A	
Approach Delay (s)	13.0	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		40.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↗	↘		↗	↘	
Volume (vph)	17	494	14	18	417	22	18	0	30	33	0	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		1.00			0.99		1.00	0.85		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3481			3468		1750	1566		1750	1566	
Flt Permitted		0.94			0.93		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		3272			3235		1842	1566		1842	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	537	15	20	453	24	20	0	33	36	0	39
RTOR Reduction (vph)	0	3	0	0	6	0	0	30	0	0	35	0
Lane Group Flow (vph)	0	567	0	0	491	0	20	3	0	36	4	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.3			18.3		2.7	2.7		2.7	2.7	
Effective Green, g (s)		18.3			18.3		2.7	2.7		2.7	2.7	
Actuated g/C Ratio		0.63			0.63		0.09	0.09		0.09	0.09	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2065			2041		171	146		171	146	
v/s Ratio Prot								0.00			0.00	
v/s Ratio Perm		c0.17			0.15		0.01			c0.02		
v/c Ratio		0.27			0.24		0.12	0.02		0.21	0.02	
Uniform Delay, d1		2.4			2.3		12.1	11.9		12.2	12.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		0.3	0.1		0.6	0.1	
Delay (s)		2.5			2.4		12.4	12.0		12.8	12.0	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.5			2.4			12.1			12.4	
Approach LOS		A			A			B			B	

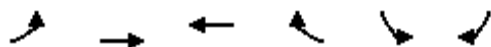
Intersection Summary

HCM Average Control Delay	3.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	29.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

37: Hwy 97 On/Off-ramp & RecPlace Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑			↗
Volume (veh/h)	0	0	224	0	0	145
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	243	0	0	158
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	243				243	243
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				243	243
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	80
cM capacity (veh/h)	1323				745	795

Direction, Lane #	WB 1	SB 1
Volume Total	243	158
Volume Left	0	0
Volume Right	0	158
cSH	1700	795
Volume to Capacity	0.14	0.20
Queue Length 95th (m)	0.0	5.6
Control Delay (s)	0.0	10.6
Lane LOS		B
Approach Delay (s)	0.0	10.6
Approach LOS		B

Intersection Summary			
Average Delay		4.2	
Intersection Capacity Utilization	27.4%		ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑	↗	↘↗	↑↑	↗	↘	↑↑	↗
Volume (vph)	71	634	1262	183	841	156	517	701	60	146	1491	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1796	3506	1785	1780	3573	1792	3399	3660	1498	1741	3635	1763
Flt Permitted	0.12	1.00	1.00	0.14	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	222	3506	1785	267	3573	1792	3399	3660	1498	1741	3635	1763
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	689	1372	199	914	170	562	762	65	159	1621	45
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	45	0	0	3
Lane Group Flow (vph)	77	689	1372	199	914	123	562	762	20	159	1621	42
Confl. Peds. (#/hr)	1					1	9					9
Heavy Vehicles (%)	0%	7%	2%	2%	5%	1%	2%	2%	21%	1%	0%	0%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	40.0	34.0	145.0	43.0	35.5	75.9	19.4	37.0	44.5	40.4	57.4	63.4
Effective Green, g (s)	40.0	34.0	145.0	43.0	35.5	75.9	19.4	37.0	44.5	40.4	57.4	63.4
Actuated g/C Ratio	0.28	0.23	1.00	0.30	0.24	0.52	0.13	0.26	0.31	0.28	0.40	0.44
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	126	822	1785	157	875	938	455	934	460	485	1439	771
v/s Ratio Prot	0.03	0.20		c0.07	0.26	0.04	c0.17	0.21	0.00	0.09	c0.45	0.00
v/s Ratio Perm	0.14		c0.77	c0.31		0.03			0.01			0.02
v/c Ratio	0.61	0.84	0.77	1.27	1.04	0.13	1.24	0.82	0.04	0.33	1.13	0.05
Uniform Delay, d1	43.0	52.9	0.0	46.8	54.8	17.7	62.8	50.8	35.3	41.5	43.8	23.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	8.3	3.2	161.0	42.7	0.1	123.6	5.6	0.0	0.4	66.5	0.0
Delay (s)	51.4	61.2	3.2	207.8	97.5	17.7	186.4	56.4	35.3	41.9	110.3	23.6
Level of Service	D	E	A	F	F	B	F	E	D	D	F	C
Approach Delay (s)		23.7			104.0			108.0			102.2	
Approach LOS		C			F			F			F	

Intersection Summary

HCM Average Control Delay	78.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	19.7
Intersection Capacity Utilization	106.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↘
Volume (veh/h)	0	156	49	1317	2442	626
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	170	53	1432	2654	680
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.80					
vC, conflicting volume	3817	1225	2654			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4027	1225	2654			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	2	67			
cM capacity (veh/h)	1	174	161			

































Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	170	53	716	716	1062	1062	1211
Volume Left	0	53	0	0	0	0	0
Volume Right	170	0	0	0	0	0	680
cSH	174	161	1700	1700	1700	1700	1700
Volume to Capacity	0.98	0.33	0.42	0.42	0.62	0.62	0.71
Queue Length 95th (m)	58.6	10.3	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	115.7	38.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	115.7	1.4			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		4.3	
Intersection Capacity Utilization		77.5%	ICU Level of Service D
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 		 	 		 	 		   		
Volume (vph)	545	397	453	780	606	64	360	867	219	91	1618	691
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3770	1596	3390	3450	1594	3424	3622	1812	1725	5250	1830
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	3236	3770	1596	3390	3450	1594	3424	3622	1812	307	5250	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	592	432	492	848	659	70	391	942	238	99	1759	751
RTOR Reduction (vph)	0	0	1	0	0	13	0	0	50	0	0	0
Lane Group Flow (vph)	592	432	491	848	659	57	391	942	188	99	1759	751
Confl. Peds. (#/hr)	3		5	5		3						
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	3%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	25.4	20.1	35.2	32.4	27.2	35.5	15.1	50.2	82.6	51.5	43.2	134.8
Effective Green, g (s)	25.4	20.1	35.2	32.4	27.2	35.5	15.1	50.2	82.6	51.5	43.2	134.8
Actuated g/C Ratio	0.19	0.15	0.26	0.24	0.20	0.26	0.11	0.37	0.61	0.38	0.32	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	610	562	417	815	696	420	384	1349	1110	205	1682	1830
v/s Ratio Prot	0.18	0.11	c0.13	c0.25	0.19	0.01	0.11	0.26	0.04	0.03	c0.34	
v/s Ratio Perm			0.18			0.03			0.06	0.16		0.41
v/c Ratio	0.97	0.77	1.18	1.04	0.95	0.14	1.02	0.70	0.17	0.48	1.05	0.41
Uniform Delay, d1	54.3	55.1	49.8	51.2	53.1	37.9	59.9	35.9	11.3	29.0	45.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	29.0	6.3	101.8	42.5	21.8	0.1	50.6	2.0	0.1	1.8	35.0	0.7
Delay (s)	83.3	61.4	151.6	93.7	74.9	38.1	110.5	37.9	11.4	30.8	80.8	0.7
Level of Service	F	E	F	F	E	D	F	D	B	C	F	A
Approach Delay (s)		99.2			83.4			51.9			55.8	
Approach LOS		F			F			D			E	
Intersection Summary												
HCM Average Control Delay			70.0									HCM Level of Service E
HCM Volume to Capacity ratio			1.09									
Actuated Cycle Length (s)			134.8									Sum of lost time (s) 24.1
Intersection Capacity Utilization			96.8%									ICU Level of Service F
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↑↑	↘
Volume (veh/h)	0	182	68	1439	2492	216
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.92
Hourly flow rate (vph)	0	196	73	1547	2680	235
Pedestrians	1					
Lane Width (m)	4.8					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	3600	1341	2681			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3600	1341	2681			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	53			
cM capacity (veh/h)	2	144	157			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	196	73	774	774	1340	1340	235
Volume Left	0	73	0	0	0	0	0
Volume Right	196	0	0	0	0	0	235
cSH	144	157	1700	1700	1700	1700	1700
Volume to Capacity	1.36	0.47	0.46	0.46	0.79	0.79	0.14
Queue Length 95th (m)	94.4	16.5	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	260.3	46.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	260.3	2.1			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		11.5	
Intersection Capacity Utilization	86.8%		ICU Level of Service E
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	330	203	321	519	60	416	263	252	125	318	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1769	3542	1497	1732	3451		1743	3490	1684	1760	3402	
Flt Permitted	0.43	1.00	1.00	0.34	1.00		0.27	1.00	1.00	0.58	1.00	
Satd. Flow (perm)	794	3542	1497	612	3451		495	3490	1684	1084	3402	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	58	340	209	331	535	62	429	271	260	129	328	88
RTOR Reduction (vph)	0	0	102	0	7	0	0	0	97	0	20	0
Lane Group Flow (vph)	58	340	107	331	590	0	429	271	163	129	396	0
Confl. Peds. (#/hr)	6		13	13		6	11		6	6		11
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	21.7	17.1	40.2	39.2	28.6		46.8	34.7	50.8	23.8	17.7	
Effective Green, g (s)	21.7	17.1	40.2	39.2	28.6		46.8	34.7	50.8	23.8	17.7	
Actuated g/C Ratio	0.22	0.17	0.41	0.40	0.29		0.48	0.35	0.52	0.24	0.18	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	222	618	706	429	1007		531	1236	976	305	614	
v/s Ratio Prot	0.01	0.10	0.04	c0.13	0.17		c0.19	0.08	0.03	0.03	0.12	
v/s Ratio Perm	0.05		0.04	c0.18			c0.20		0.07	0.08		
v/c Ratio	0.26	0.55	0.15	0.77	0.59		0.81	0.22	0.17	0.42	0.64	
Uniform Delay, d1	30.7	36.9	18.2	22.4	29.6		18.9	22.2	12.4	30.3	37.2	
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	0.6	1.3	0.1	8.4	1.0		8.8	0.1	0.1	0.9	2.6	
Delay (s)	31.3	38.2	18.3	30.8	30.7		27.7	22.3	12.5	31.3	39.8	
Level of Service	C	D	B	C	C		C	C	B	C	D	
Approach Delay (s)		30.7			30.7			22.1			37.8	
Approach LOS		C			C			C			D	

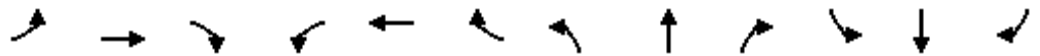
Intersection Summary

HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	98.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	86	390	96	86	409	378	114	368	113	243	370	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.95	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.98	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.96		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	3327		1707	3733	1726	1741	1813		1812	2012	
Flt Permitted	0.42	1.00		0.34	1.00	1.00	0.46	1.00		0.16	1.00	
Satd. Flow (perm)	737	3327		606	3733	1726	839	1813		308	2012	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	102	464	114	102	487	450	136	438	135	289	440	111
RTOR Reduction (vph)	0	34	0	0	0	107	0	17	0	0	14	0
Lane Group Flow (vph)	102	544	0	102	487	343	136	556	0	289	537	0
Confl. Peds. (#/hr)	28		30	30		28	38		44	44		38
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	2%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	15.3	15.3		15.3	15.3	22.4	22.2	22.2		34.3	34.3	
Effective Green, g (s)	15.3	15.3		15.3	15.3	22.4	22.2	22.2		34.3	34.3	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.36	0.36	0.36		0.56	0.56	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	183	826		151	927	628	302	653		345	1120	
v/s Ratio Prot		0.16			0.13	0.06		0.31		c0.10	0.27	
v/s Ratio Perm	0.14			c0.17		0.14	0.16			c0.37		
v/c Ratio	0.56	0.66		0.68	0.53	0.55	0.45	0.85		0.84	0.48	
Uniform Delay, d1	20.2	20.8		20.9	20.0	15.6	15.0	18.2		10.9	8.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.5	2.1		12.3	0.7	1.2	1.5	10.7		16.7	0.4	
Delay (s)	24.7	22.9		33.2	20.7	16.8	16.5	28.9		27.6	8.7	
Level of Service	C	C		C	C	B	B	C		C	A	
Approach Delay (s)		23.2			20.2			26.5			15.2	
Approach LOS		C			C			C			B	

Intersection Summary

HCM Average Control Delay	20.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	61.6	Sum of lost time (s)	11.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	21	117	109	3	228	184	60	158	6	129	283	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.93		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2043	1975		1921	1871		2030	2109		2022	2076	
Flt Permitted	0.32	1.00		0.58	1.00		0.42	1.00		0.63	1.00	
Satd. Flow (perm)	686	1975		1178	1871		904	2109		1332	2076	
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)	27	150	140	4	292	236	77	203	8	165	363	49
RTOR Reduction (vph)	0	85	0	0	73	0	0	4	0	0	13	0
Lane Group Flow (vph)	27	205	0	4	455	0	77	207	0	165	399	0
Confl. Peds. (#/hr)	3		3	3		3	24		2	2		24
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	3%
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.6	12.6		12.6	12.6		11.3	11.3		11.3	11.3	
Effective Green, g (s)	12.6	12.6		12.6	12.6		11.3	11.3		11.3	11.3	
Actuated g/C Ratio	0.39	0.39		0.39	0.39		0.35	0.35		0.35	0.35	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	271	780		465	739		320	747		472	735	
v/s Ratio Prot		0.10			c0.24			0.10				c0.19
v/s Ratio Perm	0.04			0.00			0.09			0.12		
v/c Ratio	0.10	0.26		0.01	0.62		0.24	0.28		0.35	0.54	
Uniform Delay, d1	6.1	6.5		5.9	7.7		7.3	7.4		7.6	8.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.0	1.5		0.4	0.2		0.5	0.8	
Delay (s)	6.2	6.7		5.9	9.2		7.7	7.6		8.0	9.1	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		6.7			9.2			7.6			8.8	
Approach LOS		A			A			A			A	

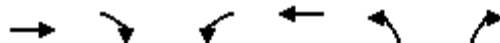
Intersection Summary

HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	31.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	690	127	443	668	0	205
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	831	153	534	805	0	247
Pedestrians	159			2	12	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	14			0	1	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.95	0.95	0.95	
vC, conflicting volume			843	2472	430	
vC1, stage 1 conf vol				843		
vC2, stage 2 conf vol				1629		
vCu, unblocked vol			738	2446	304	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)				5.8		
tF (s)			2.2	3.5	3.3	
p0 queue free %			35	100	62	
cM capacity (veh/h)			827	38	657	

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	416	416	153	267	267	402	402	247
Volume Left	0	0	0	267	267	0	0	0
Volume Right	0	0	153	0	0	0	0	247
cSH	1700	1700	1700	827	827	1700	1700	657
Volume to Capacity	0.24	0.24	0.09	0.65	0.65	0.24	0.24	0.38
Queue Length 95th (m)	0.0	0.0	0.0	36.7	36.7	0.0	0.0	13.3
Control Delay (s)	0.0	0.0	0.0	16.9	16.9	0.0	0.0	13.7
Lane LOS				C	C	B		
Approach Delay (s)	0.0			6.7			13.7	
Approach LOS							B	

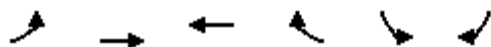
Intersection Summary

Average Delay	4.8	
Intersection Capacity Utilization	45.7%	ICU Level of Service A
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis

9: Hwy 97 On-ramp & Hwy 97 Ramp

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑	↗		↗
Volume (veh/h)	0	0	390	471	0	101
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	424	512	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	424				424	424
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	424				424	424
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	83
cM capacity (veh/h)	1135				587	630
Direction, Lane #	WB 1	WB 2	SB 1			
Volume Total	424	512	110			
Volume Left	0	0	0			
Volume Right	0	512	110			
cSH	1700	1700	630			
Volume to Capacity	0.25	0.30	0.17			
Queue Length 95th (m)	0.0	0.0	4.8			
Control Delay (s)	0.0	0.0	11.9			
Lane LOS			B			
Approach Delay (s)	0.0		11.9			
Approach LOS			B			
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			33.4%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	172	409	264	724	575	202	178	216	254	334	13	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	0.97	0.91	0.91	0.97	0.95		1.00	0.95	0.95	0.97	0.95	0.95
Frbp, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	1.00	0.99	1.00	0.98	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98	0.85	1.00	0.96		1.00	0.98	0.85	1.00	0.87	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3517	3542	1535	3657	3595		1862	1841	1589	3657	1616	1582
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.54	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3517	3542	1535	3657	3595		1063	1841	1589	3657	1616	1582
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	195	465	300	823	653	230	202	245	289	380	15	195
RTOR Reduction (vph)	0	13	151	0	39	0	0	7	24	0	74	74
Lane Group Flow (vph)	195	521	80	823	844	0	202	278	225	380	33	29
Confl. Peds. (#/hr)	14					14	7		4	4		7
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Prot		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases			4				2		2			6
Actuated Green, G (s)	7.1	16.9	28.0	16.1	25.9		30.4	19.3	35.4	7.1	15.3	22.4
Effective Green, g (s)	7.1	16.9	28.0	16.1	25.9		30.4	19.3	35.4	7.1	15.3	22.4
Actuated g/C Ratio	0.09	0.21	0.35	0.20	0.32		0.38	0.24	0.44	0.09	0.19	0.28
Clearance Time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	311	745	535	732	1158		512	442	700	323	308	441
v/s Ratio Prot	0.06	0.15	0.02	c0.23	c0.23		c0.05	c0.15	0.06	c0.10	0.02	0.01
v/s Ratio Perm			0.03				0.09		0.08			0.01
v/c Ratio	0.63	0.70	0.15	1.12	0.73		0.39	0.63	0.32	1.18	0.11	0.07
Uniform Delay, d1	35.4	29.4	18.0	32.2	24.1		17.6	27.3	14.7	36.6	26.9	21.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.4	3.1	0.1	73.0	2.5		0.5	3.2	0.4	107.0	0.2	0.1
Delay (s)	39.8	32.5	18.2	105.1	26.6		18.1	30.5	15.0	143.6	27.1	21.4
Level of Service	D	C	B	F	C		B	C	B	F	C	C
Approach Delay (s)		30.5			64.5			21.9			101.2	
Approach LOS		C			E			C			F	

Intersection Summary

HCM Average Control Delay	53.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	80.4	Sum of lost time (s)	9.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	114	96	55	170	23	143	67	13	72	27	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.98		1.00	0.98		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1888		1945	2110		2046	1803		1750	1622	
Flt Permitted	0.63	1.00		0.62	1.00		0.80	1.00		0.80	1.00	
Satd. Flow (perm)	1154	1888		1262	2110		1723	1803		1474	1622	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	124	104	60	185	25	155	73	14	78	29	113
RTOR Reduction (vph)	0	54	0	0	10	0	0	11	0	0	90	0
Lane Group Flow (vph)	32	174	0	60	200	0	155	76	0	78	52	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	2%	0%	0%	5%	0%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.1	12.1		12.1	12.1		5.0	5.0		5.0	5.0	
Effective Green, g (s)	12.1	12.1		12.1	12.1		5.0	5.0		5.0	5.0	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.20	0.20		0.20	0.20	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	556	910		608	1017		343	359		294	323	
v/s Ratio Prot		0.09			c0.09			0.04			0.03	
v/s Ratio Perm	0.03			0.05			c0.09			0.05		
v/c Ratio	0.06	0.19		0.10	0.20		0.45	0.21		0.27	0.16	
Uniform Delay, d1	3.5	3.7		3.5	3.7		8.8	8.4		8.5	8.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.1		0.1	0.1		0.9	0.3		0.5	0.2	
Delay (s)	3.5	3.8		3.6	3.8		9.8	8.7		9.0	8.5	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		3.8			3.8			9.4			8.7	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	25.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	96	823	61	107	725
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	104	895	66	116	788
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1948	928			961	
vC1, stage 1 conf vol	928					
vC2, stage 2 conf vol	1021					
vCu, unblocked vol	1948	928			961	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	68			84	
cM capacity (veh/h)	233	325			716	

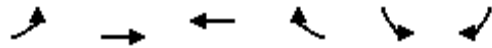
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	145	961	116	788
Volume Left	40	0	116	0
Volume Right	104	66	0	0
cSH	450	1700	716	1700
Volume to Capacity	0.32	0.57	0.16	0.46
Queue Length 95th (m)	10.4	0.0	4.4	0.0
Control Delay (s)	21.9	0.0	11.0	0.0
Lane LOS	C		B	
Approach Delay (s)	21.9	0.0	1.4	
Approach LOS	C			

Intersection Summary			
Average Delay		2.2	
Intersection Capacity Utilization		66.3%	ICU Level of Service C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	1394	802	87	0	65
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1515	872	95	0	71
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.87	
vC, conflicting volume	966				1677	265
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	966				1482	265
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	708				101	733

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	758	758	249	249	249	219	71
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	95	71
cSH	1700	1700	1700	1700	1700	1700	733
Volume to Capacity	0.45	0.45	0.15	0.15	0.15	0.13	0.10
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	2.4
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.4
Lane LOS							B
Approach Delay (s)	0.0		0.0				10.4
Approach LOS							B

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization	41.9%		ICU Level of Service A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	8	875	13	13	749
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	9	951	14	14	814
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1801	958			965	
vC1, stage 1 conf vol	958					
vC2, stage 2 conf vol	842					
vCu, unblocked vol	1801	958			965	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	97			98	
cM capacity (veh/h)	283	312			713	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	13	965	14	814
Volume Left	4	0	14	0
Volume Right	9	14	0	0
cSH	468	1700	713	1700
Volume to Capacity	0.03	0.57	0.02	0.48
Queue Length 95th (m)	0.7	0.0	0.5	0.0
Control Delay (s)	17.2	0.0	10.1	0.0
Lane LOS	C		B	
Approach Delay (s)	17.2	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	13	875	16	12	742
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	14	951	17	13	807
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)			265			
pX, platoon unblocked	0.79	0.79			0.79	
vC, conflicting volume	1792	960			968	
vC1, stage 1 conf vol	960					
vC2, stage 2 conf vol	833					
vCu, unblocked vol	1868	820			830	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	95			98	
cM capacity (veh/h)	264	298			636	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	23	968	13	807
Volume Left	9	0	13	0
Volume Right	14	17	0	0
cSH	481	1700	636	1700
Volume to Capacity	0.05	0.57	0.02	0.47
Queue Length 95th (m)	1.1	0.0	0.5	0.0
Control Delay (s)	18.2	0.0	10.8	0.0
Lane LOS	C		B	
Approach Delay (s)	18.2	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		57.0%	ICU Level of Service B
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↕	↕		↕	↕	
Volume (vph)	61	705	48	63	782	80	45	0	73	68	0	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.85		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3456			3443		1750	1566		1750	1566	
Flt Permitted		0.84			0.86		0.83	1.00		0.83	1.00	
Satd. Flow (perm)		2919			2971		1535	1566		1535	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	66	766	52	68	850	87	49	0	79	74	0	80
RTOR Reduction (vph)	0	7	0	0	11	0	0	68	0	0	69	0
Lane Group Flow (vph)	0	877	0	0	994	0	49	11	0	74	11	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		21.9			21.9		4.8	4.8		4.8	4.8	
Effective Green, g (s)		21.9			21.9		4.8	4.8		4.8	4.8	
Actuated g/C Ratio		0.63			0.63		0.14	0.14		0.14	0.14	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1842			1875		212	217		212	217	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		0.30			0.33		0.03			0.05		
v/c Ratio		0.48			0.53		0.23	0.05		0.35	0.05	
Uniform Delay, d1		3.4			3.5		13.3	13.0		13.5	13.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.3		0.6	0.1		1.0	0.1	
Delay (s)		3.6			3.8		13.9	13.1		14.5	13.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		3.6			3.8			13.4			13.8	
Approach LOS		A			A			B			B	

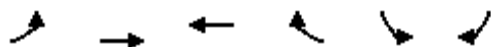
Intersection Summary

HCM Average Control Delay	5.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	34.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

37: Hwy 97 Ramp & RecPlace Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑			↗
Volume (veh/h)	0	0	224	0	0	637
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	243	0	0	692
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	243				243	243
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				243	243
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	13
cM capacity (veh/h)	1323				745	795

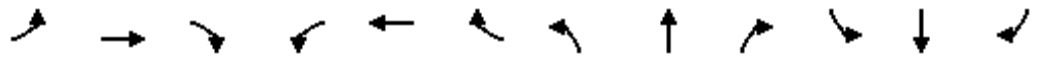
Direction, Lane #	WB 1	SB 1
Volume Total	243	692
Volume Left	0	0
Volume Right	0	692
cSH	1700	795
Volume to Capacity	0.14	0.87
Queue Length 95th (m)	0.0	83.0
Control Delay (s)	0.0	31.6
Lane LOS		D
Approach Delay (s)	0.0	31.6
Approach LOS		D

Intersection Summary			
Average Delay		23.4	
Intersection Capacity Utilization	57.9%		ICU Level of Service B
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗	↘	↘	↗	↘	↘	↗	↘	↘	↗	↘
Volume (vph)	89	484	1610	140	500	121	668	884	34	91	1366	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1727	3642	1821	1763	3573	1809	3467	3696	1523	1707	3599	1779
Flt Permitted	0.21	1.00	1.00	0.23	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	378	3642	1821	418	3573	1809	3467	3696	1523	1707	3599	1779
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	102	556	1851	161	575	139	768	1016	39	105	1570	67
RTOR Reduction (vph)	0	0	0	0	0	39	0	0	24	0	0	14
Lane Group Flow (vph)	102	556	1851	161	575	100	768	1016	15	105	1570	53
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	4%	3%	0%	3%	5%	0%	0%	1%	19%	3%	1%	0%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	35.6	29.6	140.7	35.6	29.6	62.1	24.4	46.5	52.5	32.5	54.0	60.0
Effective Green, g (s)	35.6	29.6	140.7	35.6	29.6	62.1	24.4	46.5	52.5	32.5	54.0	60.0
Actuated g/C Ratio	0.25	0.21	1.00	0.25	0.21	0.44	0.17	0.33	0.37	0.23	0.38	0.43
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	153	766	1821	163	752	798	601	1221	568	394	1381	759
v/s Ratio Prot	0.03	0.15		0.04	0.16	0.03	0.22	0.27	0.00	0.06	c0.44	0.00
v/s Ratio Perm	0.14		c1.02	0.21		0.03			0.01			0.03
v/c Ratio	0.67	0.73	1.02	0.99	0.76	0.13	1.28	0.83	0.03	0.27	1.14	0.07
Uniform Delay, d1	43.9	51.8	70.3	51.0	52.3	23.2	58.1	43.5	27.9	44.3	43.3	23.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	4.2	25.3	66.2	5.5	0.1	137.6	5.0	0.0	0.4	71.0	0.0
Delay (s)	54.4	56.0	95.6	117.2	57.7	23.3	195.7	48.5	27.9	44.7	114.3	23.9
Level of Service	D	E	F	F	E	C	F	D	C	D	F	C
Approach Delay (s)		85.2			63.2			110.1			106.7	
Approach LOS		F			E			F			F	

Intersection Summary

HCM Average Control Delay	94.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	140.7	Sum of lost time (s)	0.0
Intersection Capacity Utilization	100.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	222	70	1755	2184	935
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	239	75	1887	2348	1005
Pedestrians				2	1	
Lane Width (m)				3.8	3.4	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.72					
vC, conflicting volume	3946	1287	2348			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4314	1287	2348			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	65			
cM capacity (veh/h)	1	158	212			

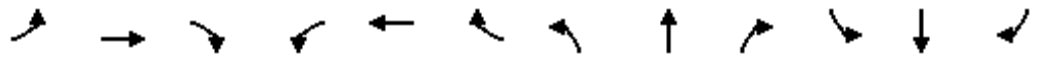
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	239	75	944	944	939	939	1475
Volume Left	0	75	0	0	0	0	0
Volume Right	239	0	0	0	0	0	1005
cSH	158	212	1700	1700	1700	1700	1700
Volume to Capacity	1.51	0.35	0.56	0.56	0.55	0.55	0.87
Queue Length 95th (m)	120.1	11.5	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	314.0	31.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	314.0	1.2			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		13.9	
Intersection Capacity Utilization	83.7%		ICU Level of Service E
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↑↑	↖	↖↗	↑↑	↖	↖	↑↑↑	↖
Volume (vph)	619	333	365	329	494	43	610	1026	266	79	1246	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3733	1605	3390	3450	1615	3390	3693	1812	1725	5250	1808
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	3236	3733	1605	3390	3450	1615	3390	3693	1812	244	5250	1808
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	696	374	410	370	555	48	685	1153	299	89	1400	933
RTOR Reduction (vph)	0	0	13	0	0	10	0	0	54	0	0	0
Lane Group Flow (vph)	696	374	397	370	555	38	685	1153	245	89	1400	933
Confl. Peds. (#/hr)			2	2			1					1
Heavy Vehicles (%)	1%	1%	0%	1%	0%	0%	1%	1%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	30.8	19.8	48.6	34.9	24.0	32.0	28.8	58.5	93.4	45.5	37.5	145.0
Effective Green, g (s)	30.8	19.8	48.6	34.9	24.0	32.0	28.8	58.5	93.4	45.5	37.5	145.0
Actuated g/C Ratio	0.21	0.14	0.34	0.24	0.17	0.22	0.20	0.40	0.64	0.31	0.26	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	687	510	538	816	571	356	673	1490	1167	158	1358	1808
v/s Ratio Prot	c0.22	0.10	0.15	0.11	c0.16	0.01	c0.20	0.31	0.05	0.03	c0.27	
v/s Ratio Perm			0.10			0.02			0.08	0.15		0.52
v/c Ratio	1.01	0.73	0.74	0.45	0.97	0.11	1.02	0.77	0.21	0.56	1.03	0.52
Uniform Delay, d1	57.1	60.1	42.6	46.9	60.2	45.1	58.1	37.5	10.6	37.2	53.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.6	5.4	5.2	0.4	30.5	0.1	39.2	3.0	0.1	4.5	32.7	1.1
Delay (s)	94.7	65.5	47.8	47.3	90.6	45.2	97.3	40.5	10.7	41.8	86.5	1.1
Level of Service	F	E	D	D	F	D	F	D	B	D	F	A
Approach Delay (s)		74.3			71.9			54.6			51.9	
Approach LOS		E			E			D			D	

Intersection Summary		
HCM Average Control Delay	60.2	HCM Level of Service E
HCM Volume to Capacity ratio	1.01	
Actuated Cycle Length (s)	145.0	Sum of lost time (s) 23.9
Intersection Capacity Utilization	92.5%	ICU Level of Service F
Analysis Period (min)	15	

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↓↓	↙
Volume (veh/h)	0	193	83	1626	1509	304
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	214	92	1807	1677	338
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2764	838	1677			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2764	838	1677			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	31	75			
cM capacity (veh/h)	12	311	374			

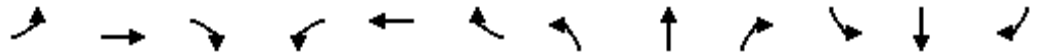
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	214	92	903	903	838	838	338
Volume Left	0	92	0	0	0	0	0
Volume Right	214	0	0	0	0	0	338
cSH	311	374	1700	1700	1700	1700	1700
Volume to Capacity	0.69	0.25	0.53	0.53	0.49	0.49	0.20
Queue Length 95th (m)	36.2	7.3	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	38.7	17.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	C					
Approach Delay (s)	38.7	0.9			0.0		
Approach LOS	E						

Intersection Summary			
Average Delay		2.4	
Intersection Capacity Utilization	60.3%		ICU Level of Service B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	384	195	173	225	29	485	284	303	208	410	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1757	3507	1483	1735	3407		1745	3455	1723	1747	3442	
Flt Permitted	0.54	1.00	1.00	0.16	1.00		0.11	1.00	1.00	0.52	1.00	
Satd. Flow (perm)	1004	3507	1483	295	3407		202	3455	1723	960	3442	
Peak-hour factor, PHF	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Adj. Flow (vph)	96	526	267	237	308	40	664	389	415	285	562	97
RTOR Reduction (vph)	0	0	22	0	7	0	0	0	60	0	10	0
Lane Group Flow (vph)	96	526	245	237	341	0	664	389	355	285	649	0
Confl. Peds. (#/hr)	14		11	11		14	5					5
Heavy Vehicles (%)	0%	1%	2%	0%	1%	0%	0%	1%	0%	1%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			pm+pt		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8			2		2	6		
Actuated Green, G (s)	33.3	27.3	76.4	48.3	36.3		85.4	62.3	77.3	47.4	30.3	
Effective Green, g (s)	33.3	27.3	76.4	48.3	36.3		85.4	62.3	77.3	47.4	30.3	
Actuated g/C Ratio	0.23	0.19	0.52	0.33	0.25		0.59	0.43	0.53	0.33	0.21	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	260	657	839	246	849		638	1477	985	405	716	
v/s Ratio Prot	0.02	0.15	0.10	c0.10	0.10		c0.35	0.11	0.04	0.08	0.19	
v/s Ratio Perm	0.07		0.07	c0.22			c0.26		0.17	0.15		
v/c Ratio	0.37	0.80	0.29	0.96	0.40		1.04	0.26	0.36	0.70	0.91	
Uniform Delay, d1	45.9	56.6	19.5	40.5	45.6		41.2	26.9	19.9	39.7	56.3	
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	0.9	7.3	0.2	46.9	0.4		46.7	0.1	0.2	5.5	15.4	
Delay (s)	46.8	63.9	19.6	87.3	46.1		87.9	27.0	20.1	45.2	71.7	
Level of Service	D	E	B	F	D		F	C	C	D	E	
Approach Delay (s)		48.8			62.8			52.6			63.7	
Approach LOS		D			E			D			E	

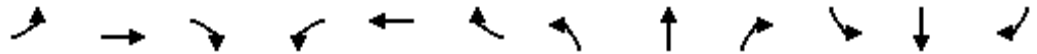
Intersection Summary

HCM Average Control Delay	56.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	145.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	81	451	11	74	462	523	20	456	160	335	352	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1723	3492		1736	3733	1797	1762	1818		1814	2054	
Flt Permitted	0.40	1.00		0.40	1.00	1.00	0.52	1.00		0.14	1.00	
Satd. Flow (perm)	734	3492		739	3733	1797	964	1818		259	2054	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	83	460	11	76	471	534	20	465	163	342	359	55
RTOR Reduction (vph)	0	2	0	0	0	117	0	18	0	0	8	0
Lane Group Flow (vph)	83	469	0	76	471	417	20	610	0	342	406	0
Confl. Peds. (#/hr)	6		5	5		6	4		6	6		4
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	14.8	14.8		14.8	14.8	25.8	24.5	24.5		40.5	40.5	
Effective Green, g (s)	14.8	14.8		14.8	14.8	25.8	24.5	24.5		40.5	40.5	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.38	0.36	0.36		0.60	0.60	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	161	768		163	821	689	351	662		410	1236	
v/s Ratio Prot		c0.13			0.13	0.10		c0.34		c0.14	0.20	
v/s Ratio Perm	0.11			0.10		0.13	0.02			0.37		
v/c Ratio	0.52	0.61		0.47	0.57	0.61	0.06	0.92		0.83	0.33	
Uniform Delay, d1	23.1	23.7		22.8	23.4	16.7	13.9	20.5		15.4	6.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	1.7		2.9	1.2	1.7	0.1	18.6		14.1	0.2	
Delay (s)	26.8	25.3		25.7	24.6	18.4	14.0	39.1		29.5	6.9	
Level of Service	C	C		C	C	B	B	D		C	A	
Approach Delay (s)		25.5			21.6			38.3			17.1	
Approach LOS		C			C			D			B	

Intersection Summary

HCM Average Control Delay	24.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	67.3	Sum of lost time (s)	17.0
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	178	79	3	248	424	95	236	3	177	197	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.98	1.00	
Frt	1.00	0.95		1.00	0.91		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2044	2040		1922	1809		2056	2159		1982	2117	
Flt Permitted	0.23	1.00		0.59	1.00		0.62	1.00		0.57	1.00	
Satd. Flow (perm)	504	2040		1194	1809		1341	2159		1194	2117	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	33	191	85	3	267	456	102	254	3	190	212	10
RTOR Reduction (vph)	0	32	0	0	123	0	0	1	0	0	4	0
Lane Group Flow (vph)	33	244	0	3	600	0	102	256	0	190	218	0
Confl. Peds. (#/hr)	2		2	2		2			28	28		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.5	18.5		18.5	18.5		9.0	9.0		9.0	9.0	
Effective Green, g (s)	18.5	18.5		18.5	18.5		9.0	9.0		9.0	9.0	
Actuated g/C Ratio	0.52	0.52		0.52	0.52		0.25	0.25		0.25	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	263	1063		622	943		340	547		303	537	
v/s Ratio Prot		0.12			c0.33			0.12			0.10	
v/s Ratio Perm	0.07			0.00			0.08			c0.16		
v/c Ratio	0.13	0.23		0.00	0.64		0.30	0.47		0.63	0.41	
Uniform Delay, d1	4.4	4.6		4.1	6.1		10.7	11.2		11.8	11.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.1		0.0	1.4		0.5	0.6		4.0	0.5	
Delay (s)	4.6	4.7		4.1	7.5		11.2	11.9		15.8	11.5	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		4.7			7.5			11.7			13.5	
Approach LOS		A			A			B			B	

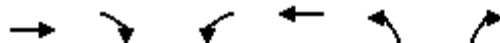
Intersection Summary

HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	35.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↑	↑↑		↑
Volume (veh/h)	734	189	575	498	0	308
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	798	205	625	541	0	335
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised		Raised			
Median storage veh	1		1			
Upstream signal (m)	207					
pX, platoon unblocked			0.92	0.92	0.92	
vC, conflicting volume			798	2318	399	
vC1, stage 1 conf vol				798		
vC2, stage 2 conf vol				1521		
vCu, unblocked vol			606	2259	173	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)				5.8		
tF (s)			2.2	3.5	3.3	
p0 queue free %			31	100	57	
cM capacity (veh/h)			903	45	780	

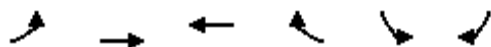
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	399	399	205	312	312	271	271	335
Volume Left	0	0	0	312	312	0	0	0
Volume Right	0	0	205	0	0	0	0	335
cSH	1700	1700	1700	903	903	1700	1700	780
Volume to Capacity	0.23	0.23	0.12	0.69	0.69	0.16	0.16	0.43
Queue Length 95th (m)	0.0	0.0	0.0	43.9	43.9	0.0	0.0	16.5
Control Delay (s)	0.0	0.0	0.0	17.4	17.4	0.0	0.0	13.0
Lane LOS				C	C	B		
Approach Delay (s)	0.0			9.3			13.0	
Approach LOS							B	

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

9: Hwy 97 On-ramp & Hwy 97 Ramp

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑	↗		↗
Volume (veh/h)	0	0	491	530	0	101
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	534	576	0	110
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	534				534	534
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	534				534	534
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	80
cM capacity (veh/h)	1034				507	546

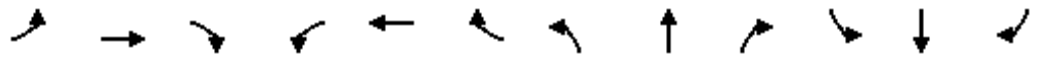
Direction, Lane #	WB 1	WB 2	SB 1
Volume Total	534	576	110
Volume Left	0	0	0
Volume Right	0	576	110
cSH	1700	1700	546
Volume to Capacity	0.31	0.34	0.20
Queue Length 95th (m)	0.0	0.0	5.7
Control Delay (s)	0.0	0.0	13.2
Lane LOS			B
Approach Delay (s)	0.0		13.2
Approach LOS			B

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization		38.8%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↖↗		↖	↑	↖	↖↗	↑	↖
Volume (vph)	258	435	355	984	662	310	219	286	320	447	21	302
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	6.0	5.0	6.0		6.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3657	3733	1643	3657	3590		1883	1984	1678	3657	1984	1669
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.74	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3657	3733	1643	3657	3590		1464	1984	1678	3657	1984	1669
Peak-hour factor, PHF	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Adj. Flow (vph)	339	572	467	1295	871	408	288	376	421	588	28	397
RTOR Reduction (vph)	0	0	325	0	43	0	0	0	2	0	0	23
Lane Group Flow (vph)	339	572	142	1295	1236	0	288	376	419	588	28	374
Confl. Peds. (#/hr)			7	7			1		1	1		1
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8			2	3	1	6	7
Permitted Phases			4				2		2			6
Actuated Green, G (s)	14.8	19.0	19.0	44.0	48.2		26.0	26.0	70.0	20.0	50.0	64.8
Effective Green, g (s)	14.8	19.0	19.0	44.0	48.2		26.0	26.0	70.0	20.0	50.0	64.8
Actuated g/C Ratio	0.11	0.15	0.15	0.34	0.37		0.20	0.20	0.54	0.15	0.38	0.50
Clearance Time (s)	5.0	6.0	6.0	5.0	6.0		6.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	416	546	240	1238	1331		293	397	904	563	763	832
v/s Ratio Prot	0.09	0.15		c0.35	c0.34			0.19	0.16	c0.16	0.01	0.05
v/s Ratio Perm			0.09				c0.20		0.09			0.17
v/c Ratio	0.81	1.05	0.59	1.05	0.93		0.98	0.95	0.46	1.04	0.04	0.45
Uniform Delay, d1	56.3	55.5	51.9	43.0	39.3		51.8	51.3	18.4	55.0	25.0	21.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.2	51.6	4.5	38.5	11.5		47.7	31.8	0.5	50.0	0.0	0.5
Delay (s)	68.5	107.1	56.4	81.5	50.8		99.5	83.1	19.0	105.0	25.0	21.6
Level of Service	E	F	E	F	D		F	F	B	F	C	C
Approach Delay (s)		80.4			66.2			62.6			70.1	
Approach LOS		F			E			E			E	

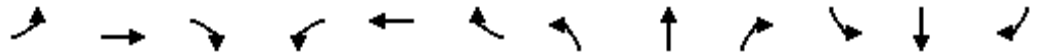
Intersection Summary		
HCM Average Control Delay	69.4	HCM Level of Service E
HCM Volume to Capacity ratio	0.98	
Actuated Cycle Length (s)	130.0	Sum of lost time (s) 15.0
Intersection Capacity Utilization	86.4%	ICU Level of Service E
Analysis Period (min)	15	

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	141	193	28	259	34	311	96	31	91	35	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.98		1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1840		2037	2114		2046	1779		1750	1623	
Flt Permitted	0.51	1.00		0.44	1.00		0.64	1.00		0.67	1.00	
Satd. Flow (perm)	939	1840		949	2114		1383	1779		1229	1623	
Peak-hour factor, PHF	0.92	0.84	0.84	0.84	0.84	0.92	0.84	0.92	0.84	0.92	0.92	0.92
Adj. Flow (vph)	46	168	230	33	308	37	370	104	37	99	38	145
RTOR Reduction (vph)	0	130	0	0	11	0	0	22	0	0	88	0
Lane Group Flow (vph)	46	268	0	33	334	0	370	119	0	99	95	0
Confl. Peds. (#/hr)			8	8								
Heavy Vehicles (%)	2%	0%	0%	0%	0%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.0	12.0		12.0	12.0		12.9	12.9		12.9	12.9	
Effective Green, g (s)	12.0	12.0		12.0	12.0		12.9	12.9		12.9	12.9	
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.39	0.39		0.39	0.39	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	342	671		346	771		542	698		482	636	
v/s Ratio Prot		0.15			c0.16			0.07			0.06	
v/s Ratio Perm	0.05			0.03			c0.27			0.08		
v/c Ratio	0.13	0.40		0.10	0.43		0.68	0.17		0.21	0.15	
Uniform Delay, d1	7.0	7.8		6.9	7.9		8.3	6.5		6.6	6.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.1	0.4		3.5	0.1		0.2	0.1	
Delay (s)	7.2	8.2		7.0	8.3		11.8	6.6		6.8	6.6	
Level of Service	A	A		A	A		B	A		A	A	
Approach Delay (s)		8.1			8.2			10.4			6.7	
Approach LOS		A			A			B			A	

Intersection Summary

HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	32.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	45	118	999	70	122	698
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)	49	128	1086	76	133	759
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		4				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2148	1124			1162	
vC1, stage 1 conf vol	1124					
vC2, stage 2 conf vol	1024					
vCu, unblocked vol	2148	1124			1162	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	76	49			78	
cM capacity (veh/h)	201	250			601	

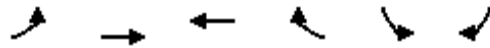
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	177	1162	133	759
Volume Left	49	0	133	0
Volume Right	128	76	0	0
cSH	345	1700	601	1700
Volume to Capacity	0.51	0.68	0.22	0.45
Queue Length 95th (m)	21.2	0.0	6.4	0.0
Control Delay (s)	32.3	0.0	12.7	0.0
Lane LOS	D		B	
Approach Delay (s)	32.3	0.0	1.9	
Approach LOS	D			

Intersection Summary			
Average Delay		3.3	
Intersection Capacity Utilization		76.9%	ICU Level of Service D
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	1316	798	135	0	93
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1430	867	147	0	101
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.86	
vC, conflicting volume	1014				1656	290
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1014				1433	290
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	86
cM capacity (veh/h)	680				107	706

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	715	715	248	248	248	271	101
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	147	101
cSH	1700	1700	1700	1700	1700	1700	706
Volume to Capacity	0.42	0.42	0.15	0.15	0.15	0.16	0.14
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	3.8
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.9
Lane LOS							B
Approach Delay (s)	0.0		0.0				10.9
Approach LOS							B

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		39.7%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	13	1056	12	11	732
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	14	1148	13	12	796
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1974	1154			1161	
vC1, stage 1 conf vol	1154					
vC2, stage 2 conf vol	820					
vCu, unblocked vol	1974	1154			1161	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	94			98	
cM capacity (veh/h)	246	240			602	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	21	1161	12	796
Volume Left	7	0	12	0
Volume Right	14	13	0	0
cSH	351	1700	602	1700
Volume to Capacity	0.06	0.68	0.02	0.47
Queue Length 95th (m)	1.4	0.0	0.5	0.0
Control Delay (s)	20.6	0.0	11.1	0.0
Lane LOS	C		B	
Approach Delay (s)	20.6	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		66.3%	ICU Level of Service C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	12	21	1047	13	10	729
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	23	1138	14	11	792
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)			265			
pX, platoon unblocked	0.75	0.75			0.75	
vC, conflicting volume	1959	1145			1152	
vC1, stage 1 conf vol	1145					
vC2, stage 2 conf vol	814					
vCu, unblocked vol	2113	1026			1036	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	89			98	
cM capacity (veh/h)	217	213			503	

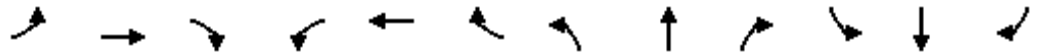
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	36	1152	11	792
Volume Left	13	0	11	0
Volume Right	23	14	0	0
cSH	335	1700	503	1700
Volume to Capacity	0.11	0.68	0.02	0.47
Queue Length 95th (m)	2.7	0.0	0.5	0.0
Control Delay (s)	23.4	0.0	12.3	0.0
Lane LOS	C		B	
Approach Delay (s)	23.4	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28

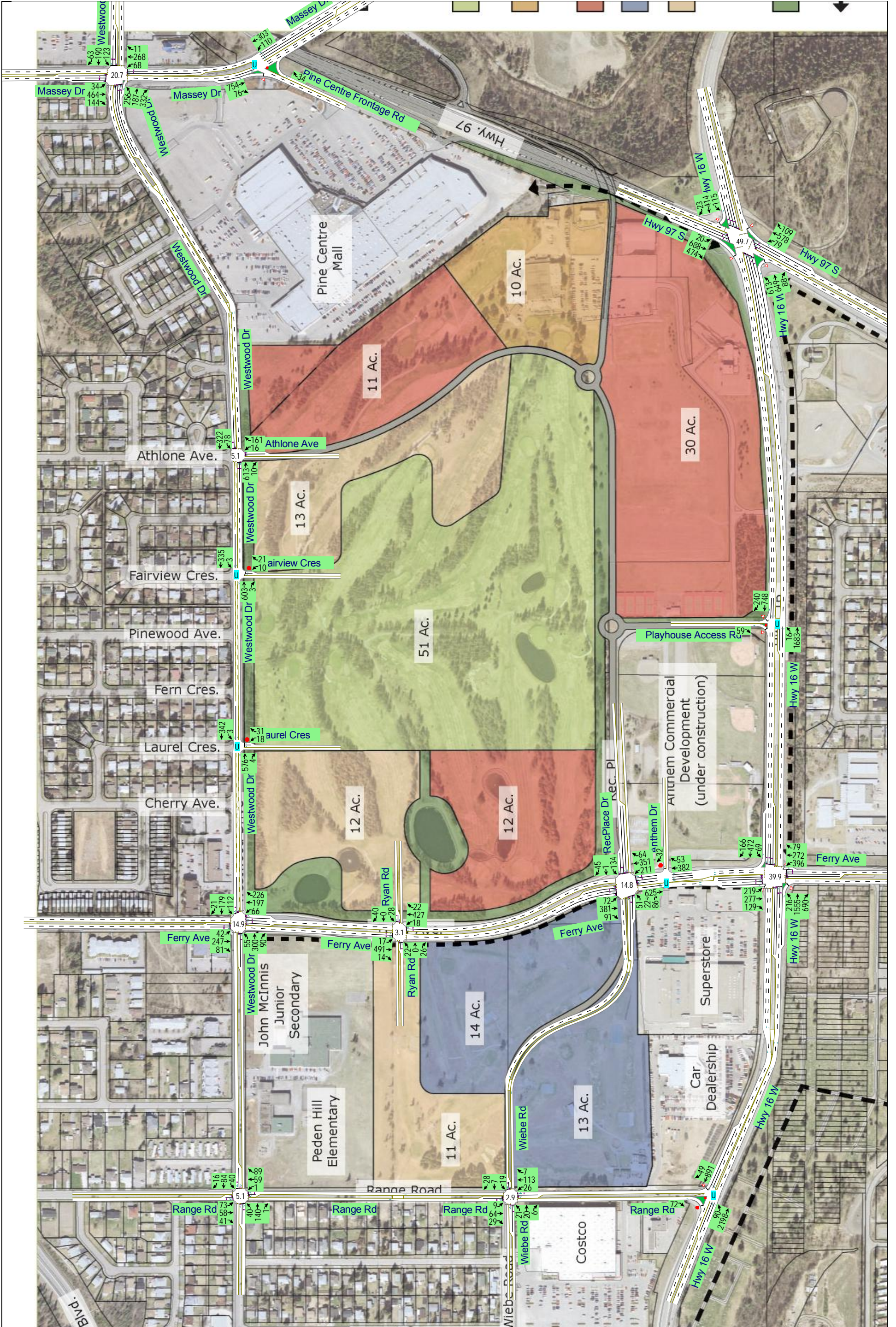


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↕	↕		↕	↕	
Volume (vph)	75	865	62	82	1002	99	58	0	95	88	0	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.85		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3455			3444		1750	1566		1750	1566	
Flt Permitted		0.78			0.81		0.69	1.00		0.69	1.00	
Satd. Flow (perm)		2716			2800		1270	1566		1272	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	940	67	89	1089	108	63	0	103	96	0	105
RTOR Reduction (vph)	0	7	0	0	10	0	0	86	0	0	82	0
Lane Group Flow (vph)	0	1082	0	0	1276	0	63	17	0	96	23	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		29.8			29.8		7.5	7.5		7.5	7.5	
Effective Green, g (s)		29.8			29.8		7.5	7.5		7.5	7.5	
Actuated g/C Ratio		0.66			0.66		0.17	0.17		0.17	0.17	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1787			1842		210	259		211	259	
v/s Ratio Prot								0.01			0.01	
v/s Ratio Perm		0.40			0.46		0.05			0.08		
v/c Ratio		0.61			0.69		0.30	0.07		0.45	0.09	
Uniform Delay, d1		4.4			4.9		16.6	15.9		17.1	16.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.1		0.8	0.1		1.6	0.2	
Delay (s)		5.0			6.0		17.4	16.1		18.6	16.2	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		5.0			6.0			16.6			17.3	
Approach LOS		A			A			B			B	

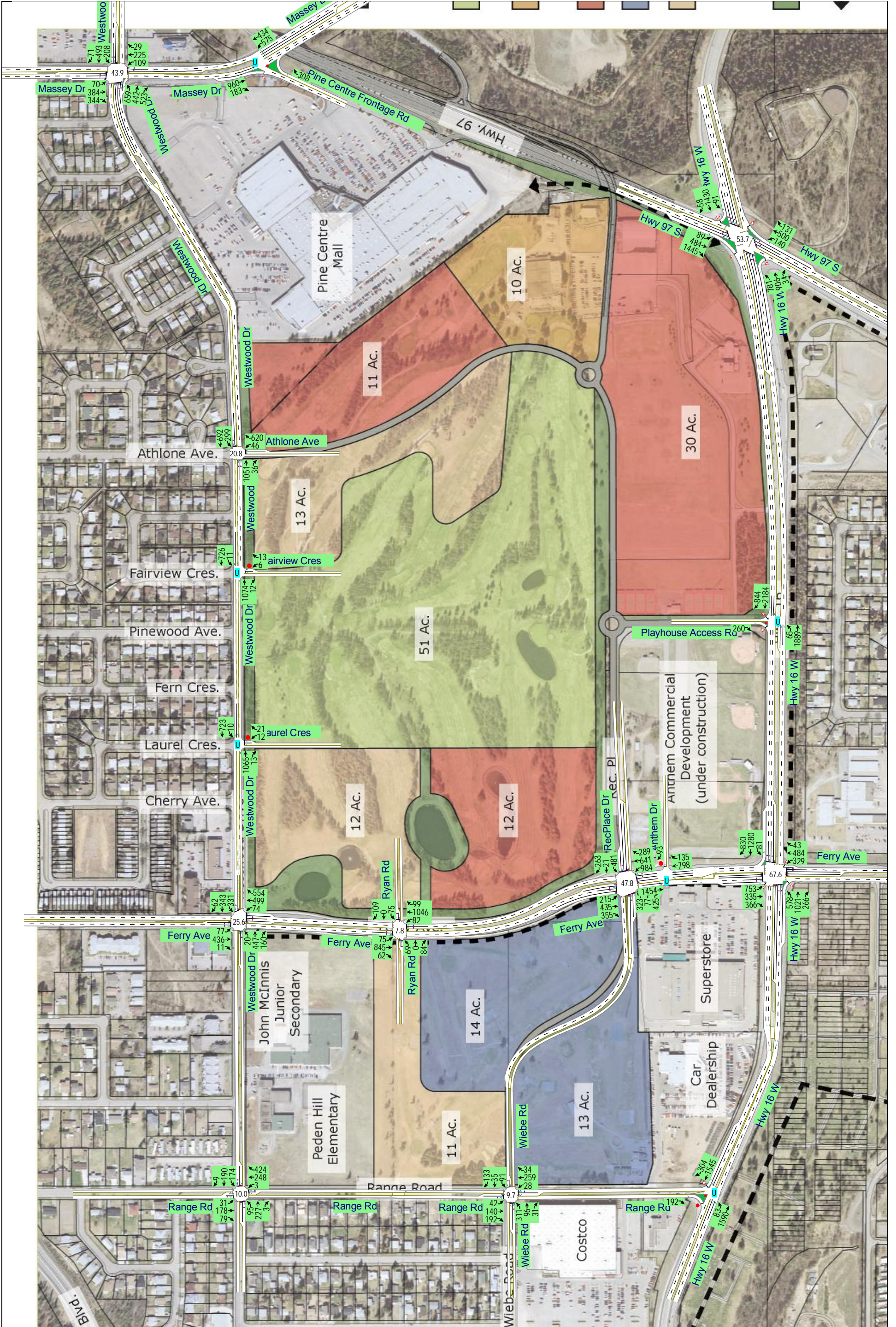
Intersection Summary

HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	45.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Intersection Sign configuration not allowed in HCM analysis.







HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑	↗	↘↗	↑↑	↗	↘	↑↑↑	↗
Volume (vph)	20	688	474	79	578	109	613	649	88	115	414	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1694	3539	1686	1713	3506	1734	3366	3624	1644	1724	5120	1671
Flt Permitted	0.32	1.00	1.00	0.19	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	579	3539	1686	336	3506	1734	3366	3624	1644	1724	5120	1671
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	23	782	539	90	657	124	697	738	100	131	470	26
RTOR Reduction (vph)	0	0	0	0	0	68	0	0	53	0	0	20
Lane Group Flow (vph)	23	782	539	90	657	56	697	738	47	131	470	6
Confl. Peds. (#/hr)	1					1	9		2	2		9
Heavy Vehicles (%)	6%	6%	8%	6%	7%	4%	3%	3%	9%	2%	2%	6%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	35.0	31.7	101.3	40.6	34.5	46.0	16.6	25.9	32.0	11.5	20.2	23.5
Effective Green, g (s)	35.0	31.7	101.3	40.6	34.5	46.0	16.6	25.9	32.0	11.5	20.2	23.5
Actuated g/C Ratio	0.35	0.31	1.00	0.40	0.34	0.45	0.16	0.26	0.32	0.11	0.20	0.23
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	236	1107	1686	218	1194	787	552	927	519	196	1021	388
v/s Ratio Prot	0.00	c0.22		0.02	0.19	0.01	c0.21	c0.20	0.01	c0.08	0.09	0.00
v/s Ratio Perm	0.03		c0.32	0.14		0.02			0.02			0.00
v/c Ratio	0.10	0.71	0.32	0.41	0.55	0.07	1.26	0.80	0.09	0.67	0.46	0.02
Uniform Delay, d1	22.2	30.7	0.0	20.7	27.1	15.6	42.4	35.2	24.4	43.1	35.7	30.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	2.6	0.5	1.3	0.9	0.0	132.2	4.8	0.1	8.3	0.3	0.0
Delay (s)	22.4	33.3	0.5	22.0	28.0	15.6	174.6	40.0	24.5	51.4	36.1	30.0
Level of Service	C	C	A	C	C	B	F	D	C	D	D	C
Approach Delay (s)		20.0			25.7			100.1			39.0	
Approach LOS		B			C			F			D	

Intersection Summary

HCM Average Control Delay	51.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	101.3	Sum of lost time (s)	21.6
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	59	16	1683	748	240
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	0	70	19	2004	890	286
Pedestrians					3	
Lane Width (m)					3.4	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.55					
vC, conflicting volume	2076	440	890			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1317	440	890			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	88	98			
cM capacity (veh/h)	81	571	770			

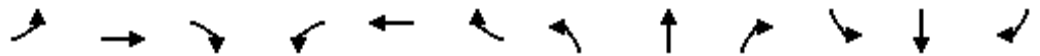
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	70	19	1002	1002	356	356	464
Volume Left	0	19	0	0	0	0	0
Volume Right	70	0	0	0	0	0	286
cSH	571	770	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.02	0.59	0.59	0.21	0.21	0.27
Queue Length 95th (m)	3.2	0.6	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.2	9.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	12.2	0.1			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization	49.9%		ICU Level of Service A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↑↑	↖	↖↗	↑↑	↖	↖	↑↑↑	↖
Volume (vph)	219	277	129	396	272	79	216	1555	690	69	472	166
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3697	1583	3292	3450	1568	3424	3622	1830	1675	5148	1808
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.08	1.00	1.00
Satd. Flow (perm)	3236	3697	1583	3292	3450	1568	3424	3622	1830	145	5148	1808
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	238	301	140	430	296	86	235	1690	750	75	513	180
RTOR Reduction (vph)	0	0	104	0	0	18	0	0	68	0	0	0
Lane Group Flow (vph)	238	301	36	430	296	68	235	1690	682	75	513	180
Confl. Peds. (#/hr)							1					1
Heavy Vehicles (%)	1%	2%	2%	4%	0%	3%	0%	3%	0%	3%	3%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	13.2	14.7	27.3	16.8	18.4	24.4	12.6	55.4	72.2	54.6	48.6	116.7
Effective Green, g (s)	13.2	14.7	27.3	16.8	18.4	24.4	12.6	55.4	72.2	54.6	48.6	116.7
Actuated g/C Ratio	0.11	0.13	0.23	0.14	0.16	0.21	0.11	0.47	0.62	0.47	0.42	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	366	466	370	474	544	328	370	1719	1132	147	2144	1808
v/s Ratio Prot	0.07	c0.08	0.01	c0.13	0.09	0.01	c0.07	c0.47	0.09	0.03	0.10	
v/s Ratio Perm			0.01			0.03			0.29	0.21		c0.10
v/c Ratio	0.65	0.65	0.10	0.91	0.54	0.21	0.64	0.98	0.60	0.51	0.24	0.10
Uniform Delay, d1	49.5	48.5	35.0	49.2	45.3	38.1	49.8	30.2	13.5	26.2	22.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	3.1	0.1	20.8	1.1	0.3	3.5	17.8	0.9	3.0	0.1	0.1
Delay (s)	53.6	51.6	35.2	70.0	46.4	38.5	53.4	48.0	14.4	29.2	22.2	0.1
Level of Service	D	D	D	E	D	D	D	D	B	C	C	A
Approach Delay (s)		48.9			58.1			39.1			17.7	
Approach LOS		D			E			D			B	

Intersection Summary		
HCM Average Control Delay	40.2	HCM Level of Service
HCM Volume to Capacity ratio	0.92	D
Actuated Cycle Length (s)	116.7	Sum of lost time (s)
Intersection Capacity Utilization	86.4%	24.0
Analysis Period (min)	15	ICU Level of Service
		E

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↓↓	↙
Volume (veh/h)	0	72	90	2198	891	49
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	77	96	2338	948	52
Pedestrians				1		
Lane Width (m)				3.7		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2309	475	948			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2309	475	948			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	86	87			
cM capacity (veh/h)	29	541	720			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	77	96	1169	1169	474	474	52
Volume Left	0	96	0	0	0	0	0
Volume Right	77	0	0	0	0	0	52
cSH	541	720	1700	1700	1700	1700	1700
Volume to Capacity	0.14	0.13	0.69	0.69	0.28	0.28	0.03
Queue Length 95th (m)	3.7	3.5	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	12.8	10.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	B					
Approach Delay (s)	12.8	0.4			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay		0.6	
Intersection Capacity Utilization		71.1%	ICU Level of Service C
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	464	144	68	268	11	256	187	332	123	190	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1652	3542	1478	1734	3489		3351	3421	1704	1762	3328	
Flt Permitted	0.57	1.00	1.00	0.34	1.00		0.95	1.00	1.00	0.62	1.00	
Satd. Flow (perm)	986	3542	1478	625	3489		3351	3421	1704	1158	3328	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	504	157	74	291	12	278	203	361	134	207	68
RTOR Reduction (vph)	0	0	93	0	3	0	0	0	137	0	39	0
Lane Group Flow (vph)	37	504	64	74	300	0	278	203	224	134	236	0
Confl. Peds. (#/hr)	7		10	10		7	5		5	5		5
Heavy Vehicles (%)	7%	0%	2%	0%	0%	0%	1%	2%	0%	0%	1%	4%
Turn Type	pm+pt		pm+ov	pm+pt			Prot		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8					2	6		
Actuated Green, G (s)	22.0	19.8	27.9	29.6	23.6		8.1	13.1	19.1	17.0	11.0	
Effective Green, g (s)	22.0	19.8	27.9	29.6	23.6		8.1	13.1	19.1	17.0	11.0	
Actuated g/C Ratio	0.32	0.29	0.40	0.43	0.34		0.12	0.19	0.28	0.25	0.16	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	336	1018	727	365	1195		394	650	621	338	531	
v/s Ratio Prot	0.00	c0.14	0.01	0.02	c0.09		c0.08	0.06	c0.03	0.03	0.07	
v/s Ratio Perm	0.03		0.03	0.07					0.10	0.06		
v/c Ratio	0.11	0.50	0.09	0.20	0.25		0.71	0.31	0.36	0.40	0.45	
Uniform Delay, d1	16.3	20.4	12.6	12.0	16.3		29.3	24.0	20.0	21.2	26.2	
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	0.1	0.5	0.1	0.3	0.2		5.7	0.4	0.4	0.8	0.8	
Delay (s)	16.5	20.9	12.7	12.3	16.4		34.9	24.4	20.4	21.9	27.0	
Level of Service	B	C	B	B	B		C	C	C	C	C	
Approach Delay (s)		18.8			15.6			26.1			25.3	
Approach LOS		B			B			C			C	

Intersection Summary

HCM Average Control Delay	22.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	68.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	42	247	81	66	197	226	55	300	90	112	179	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.97	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		0.99	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1704	3324		1719	3697	1743	1739	1792		1759	2061	
Flt Permitted	0.61	1.00		0.53	1.00	1.00	0.62	1.00		0.28	1.00	
Satd. Flow (perm)	1095	3324		955	3697	1743	1126	1792		515	2061	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	48	284	93	76	226	260	63	345	103	129	206	24
RTOR Reduction (vph)	0	51	0	0	0	173	0	18	0	0	6	0
Lane Group Flow (vph)	48	326	0	76	226	87	63	430	0	129	224	0
Confl. Peds. (#/hr)	15		16	16		15	30		20	20		30
Heavy Vehicles (%)	0%	0%	2%	0%	2%	2%	0%	2%	1%	3%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	11.8	11.8		11.8	11.8	17.9	18.6	18.6		29.7	29.7	
Effective Green, g (s)	11.8	11.8		11.8	11.8	17.9	18.6	18.6		29.7	29.7	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.33	0.35	0.35		0.56	0.56	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	242	733		211	815	583	391	623		428	1144	
v/s Ratio Prot		c0.10			0.06	0.02		c0.24		c0.03	0.11	
v/s Ratio Perm	0.04			0.08		0.03	0.06			0.13		
v/c Ratio	0.20	0.44		0.36	0.28	0.15	0.16	0.69		0.30	0.20	
Uniform Delay, d1	17.0	18.0		17.7	17.3	12.5	12.1	15.0		6.9	5.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.6		1.4	0.3	0.2	0.3	3.6		0.5	0.1	
Delay (s)	17.5	18.6		19.1	17.6	12.6	12.3	18.5		7.5	6.1	
Level of Service	B	B		B	B	B	B	B		A	A	
Approach Delay (s)		18.5			15.5			17.8			6.6	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	73	58	41	1	59	89	40	140	1	40	84	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.98	1.00		1.00	1.00		0.99	1.00		0.97	1.00	
Frt	1.00	0.94		1.00	0.91		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2005	1995		1925	1753		1983	2161		1898	2073	
Flt Permitted	0.65	1.00		0.68	1.00		0.89	1.00		0.89	1.00	
Satd. Flow (perm)	1371	1995		1385	1753		1856	2161		1776	2073	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	84	67	47	1	68	102	46	161	1	46	97	18
RTOR Reduction (vph)	0	24	0	0	53	0	0	1	0	0	15	0
Lane Group Flow (vph)	84	90	0	1	117	0	46	161	0	46	100	0
Confl. Peds. (#/hr)	33					33	10		42	42		10
Heavy Vehicles (%)	0%	0%	3%	0%	0%	4%	3%	0%	0%	4%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	11.7	11.7		11.7	11.7		4.5	4.5		4.5	4.5	
Effective Green, g (s)	11.7	11.7		11.7	11.7		4.5	4.5		4.5	4.5	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.19	0.19		0.19	0.19	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	663	965		670	848		345	402		330	385	
v/s Ratio Prot		0.04			c0.07			c0.07			0.05	
v/s Ratio Perm	0.06			0.00			0.02			0.03		
v/c Ratio	0.13	0.09		0.00	0.14		0.13	0.40		0.14	0.26	
Uniform Delay, d1	3.4	3.4		3.2	3.5		8.2	8.7		8.2	8.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.0		0.0	0.1		0.2	0.7		0.2	0.4	
Delay (s)	3.5	3.4		3.2	3.5		8.4	9.3		8.4	8.8	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		3.5			3.5			9.1			8.7	
Approach LOS		A			A			A			A	

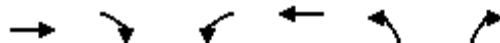
Intersection Summary

HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	24.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗	↖↗	↑↑		↗
Volume (veh/h)	754	76	110	303	0	34
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Hourly flow rate (vph)	931	94	136	374	0	42
Pedestrians	90			5	5	
Lane Width (m)	3.8			3.8	4.2	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	8			0	0	
Right turn flare (veh)						
Median type	Raised			Raised		
Median storage veh	1			1		
Upstream signal (m)	207					
pX, platoon unblocked			0.92	0.92	0.92	
vC, conflicting volume			936	1485	475	
vC1, stage 1 conf vol				936		
vC2, stage 2 conf vol				549		
vCu, unblocked vol			768	1361	270	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)				5.8		
tF (s)			2.2	3.5	3.3	
p0 queue free %			83	100	94	
cM capacity (veh/h)			781	229	673	

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	465	465	94	68	68	187	187	42
Volume Left	0	0	0	68	68	0	0	0
Volume Right	0	0	94	0	0	0	0	42
cSH	1700	1700	1700	781	781	1700	1700	673
Volume to Capacity	0.27	0.27	0.06	0.17	0.17	0.11	0.11	0.06
Queue Length 95th (m)	0.0	0.0	0.0	4.8	4.8	0.0	0.0	1.5
Control Delay (s)	0.0	0.0	0.0	10.6	10.6	0.0	0.0	10.7
Lane LOS				B	B	B		
Approach Delay (s)	0.0			2.8			10.7	
Approach LOS							B	

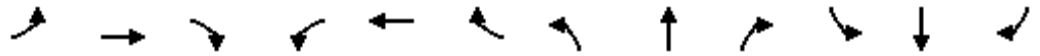
Intersection Summary

Average Delay	1.2	
Intersection Capacity Utilization	39.0%	ICU Level of Service A
Analysis Period (min)	15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	381	91	211	351	64	51	22	86	134	1	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	4.0	6.0		4.0	6.0	4.0	4.0	6.0	5.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1883	3733	1668	3621	3637		1884	1984	1120	3657	1984	1682
Flt Permitted	0.46	1.00	1.00	0.95	1.00		1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	912	3733	1668	3621	3637		1983	1984	1120	3657	1984	1682
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	90	476	114	264	439	80	64	28	108	168	1	56
RTOR Reduction (vph)	0	0	67	0	16	0	0	0	52	0	0	49
Lane Group Flow (vph)	90	476	47	264	503	0	64	28	56	168	1	7
Confl. Peds. (#/hr)	5		5	5		5	1		2	2		1
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	0%	50%	0%	0%	0%
Turn Type	pm+pt		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases	4		4				2		2			6
Actuated Green, G (s)	19.3	14.7	21.1	8.8	17.9		9.7	3.3	12.1	4.6	1.5	6.1
Effective Green, g (s)	19.3	14.7	21.1	8.8	17.9		9.7	3.3	12.1	4.6	1.5	6.1
Actuated g/C Ratio	0.38	0.29	0.41	0.17	0.35		0.19	0.06	0.24	0.09	0.03	0.12
Clearance Time (s)	5.0	6.0	4.0	4.0	6.0		4.0	6.0	4.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	4.0
Lane Grp Cap (vph)	429	1068	685	620	1267		362	127	264	327	58	200
v/s Ratio Prot	0.02	0.13	0.01	c0.07	c0.14		0.02	c0.01	0.04	c0.05	0.00	0.00
v/s Ratio Perm	0.06		0.02				c0.01		0.01			0.00
v/c Ratio	0.21	0.45	0.07	0.43	0.40		0.18	0.22	0.21	0.51	0.02	0.03
Uniform Delay, d1	10.5	15.0	9.2	19.0	12.7		17.5	22.8	15.8	22.3	24.2	20.0
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.4	0.0	0.5	0.3		0.2	1.2	0.4	1.4	0.2	0.1
Delay (s)	10.9	15.4	9.2	19.5	12.9		17.7	24.0	16.2	23.7	24.4	20.1
Level of Service	B	B	A	B	B		B	C	B	C	C	C
Approach Delay (s)		13.8			15.2			17.8			22.8	
Approach LOS		B			B			B			C	

Intersection Summary

HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	51.4	Sum of lost time (s)	18.0
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	64	29	26	113	7	21	20	6	19	7	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1939		2040	2113		2043	1784		1750	1624	
Flt Permitted	0.66	1.00		0.68	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (perm)	1223	1939		1469	2113		2150	1784		1842	1624	
Peak-hour factor, PHF	0.92	0.82	0.82	0.82	0.82	0.92	0.82	0.92	0.82	0.92	0.92	0.92
Adj. Flow (vph)	10	78	35	32	138	8	26	22	7	21	8	30
RTOR Reduction (vph)	0	13	0	0	3	0	0	7	0	0	29	0
Lane Group Flow (vph)	10	100	0	32	143	0	26	22	0	21	10	0
Confl. Peds. (#/hr)			4	4			2					
Heavy Vehicles (%)	2%	0%	0%	0%	1%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	16.7	16.7		16.7	16.7		1.3	1.3		1.3	1.3	
Effective Green, g (s)	16.7	16.7		16.7	16.7		1.3	1.3		1.3	1.3	
Actuated g/C Ratio	0.64	0.64		0.64	0.64		0.05	0.05		0.05	0.05	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	786	1245		944	1357		108	89		92	81	
v/s Ratio Prot		0.05			c0.07			c0.01			0.01	
v/s Ratio Perm	0.01			0.02			0.01			0.01		
v/c Ratio	0.01	0.08		0.03	0.11		0.24	0.25		0.23	0.12	
Uniform Delay, d1	1.7	1.8		1.7	1.8		11.9	11.9		11.9	11.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.0		0.0	0.0		1.2	1.5		1.3	0.6	
Delay (s)	1.7	1.8		1.7	1.8		13.0	13.4		13.1	12.5	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		1.8			1.8			13.2			12.7	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	4.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	26.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	22.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	16	161	613	10	78	322
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	1.00
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1750	1566	3491		1750	1842
Flt Permitted	0.95	1.00	1.00		0.30	1.00
Satd. Flow (perm)	1750	1566	3491		559	1842
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	175	666	11	85	350
RTOR Reduction (vph)	0	56	2	0	0	0
Lane Group Flow (vph)	17	119	675	0	85	350
Turn Type		pm+ov			pm+pt	
Protected Phases	8	1	2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	1.0	5.9	15.2		24.1	24.1
Effective Green, g (s)	1.0	5.9	15.2		24.1	24.1
Actuated g/C Ratio	0.03	0.18	0.46		0.73	0.73
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	53	468	1603		583	1341
v/s Ratio Prot	0.01	c0.04	c0.19		0.02	0.19
v/s Ratio Perm		0.04			0.08	
v/c Ratio	0.32	0.25	0.42		0.15	0.26
Uniform Delay, d1	15.7	11.7	6.0		1.6	1.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.5	0.3	0.2		0.1	0.1
Delay (s)	19.2	12.0	6.2		1.7	1.6
Level of Service	B	B	A		A	A
Approach Delay (s)	12.6		6.2			1.6
Approach LOS	B		A			A

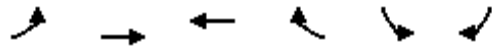
Intersection Summary

HCM Average Control Delay	5.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	33.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	625	382	53	0	32
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	679	415	58	0	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.91	
vC, conflicting volume	473				784	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	473				559	133
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	96
cM capacity (veh/h)	1085				417	892

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	340	340	119	119	119	117	35
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	58	35
cSH	1700	1700	1700	1700	1700	1700	892
Volume to Capacity	0.20	0.20	0.07	0.07	0.07	0.07	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	9.2
Lane LOS							A
Approach Delay (s)	0.0		0.0				9.2
Approach LOS							A

Intersection Summary							
Average Delay			0.3				
Intersection Capacity Utilization			20.6%		ICU Level of Service		A
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	21	603	3	3	335
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	23	655	3	3	364
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2			2
Upstream signal (m)						178
pX, platoon unblocked						
vC, conflicting volume	1028	657			659	
vC1, stage 1 conf vol	657					
vC2, stage 2 conf vol	371					
vCu, unblocked vol	1028	657			659	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	95			100	
cM capacity (veh/h)	459	465			929	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	34	659	3	364
Volume Left	11	0	3	0
Volume Right	23	3	0	0
cSH	686	1700	929	1700
Volume to Capacity	0.05	0.39	0.00	0.21
Queue Length 95th (m)	1.2	0.0	0.1	0.0
Control Delay (s)	13.1	0.0	8.9	0.0
Lane LOS	B		A	
Approach Delay (s)	13.1	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		41.9%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↷		↶	↷
Volume (veh/h)	18	31	576	4	3	342
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	34	626	4	3	372
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL			TWLTL
Median storage veh			2			2
Upstream signal (m)			265			
pX, platoon unblocked	0.92	0.92			0.92	
vC, conflicting volume	1007	628			630	
vC1, stage 1 conf vol	628					
vC2, stage 2 conf vol	378					
vCu, unblocked vol	961	548			550	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	93			100	
cM capacity (veh/h)	466	491			933	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	53	630	3	372
Volume Left	20	0	3	0
Volume Right	34	4	0	0
cSH	776	1700	933	1700
Volume to Capacity	0.07	0.37	0.00	0.22
Queue Length 95th (m)	1.7	0.0	0.1	0.0
Control Delay (s)	12.9	0.0	8.9	0.0
Lane LOS	B		A	
Approach Delay (s)	12.9	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		40.6%	ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔		↗	↘		↗	↘	
Volume (vph)	17	491	14	18	427	22	22	0	26	28	0	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		1.00			0.99		1.00	0.85		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3480			3468		1750	1566		1750	1566	
Flt Permitted		0.94			0.93		1.00	1.00		1.00	1.00	
Satd. Flow (perm)		3270			3237		1842	1566		1842	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	534	15	20	464	24	24	0	28	30	0	43
RTOR Reduction (vph)	0	3	0	0	6	0	0	25	0	0	39	0
Lane Group Flow (vph)	0	564	0	0	502	0	24	3	0	30	4	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.4			18.4		2.7	2.7		2.7	2.7	
Effective Green, g (s)		18.4			18.4		2.7	2.7		2.7	2.7	
Actuated g/C Ratio		0.63			0.63		0.09	0.09		0.09	0.09	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2068			2047		171	145		171	145	
v/s Ratio Prot								0.00			0.00	
v/s Ratio Perm		c0.17			0.16		0.01			c0.02		
v/c Ratio		0.27			0.25		0.14	0.02		0.18	0.03	
Uniform Delay, d1		2.4			2.3		12.1	12.0		12.2	12.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.1			0.1		0.4	0.0		0.5	0.1	
Delay (s)		2.4			2.4		12.5	12.0		12.7	12.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		2.4			2.4			12.3			12.3	
Approach LOS		A			A			B			B	

































Intersection Summary

HCM Average Control Delay	3.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	29.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 		 	 		  	  	
Volume (vph)	71	634	1147	183	841	165	605	718	60	146	1547	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1796	3506	1785	1780	3573	1791	3399	3660	1498	1741	5223	1764
Flt Permitted	0.12	1.00	1.00	0.13	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	222	3506	1785	245	3573	1791	3399	3660	1498	1741	5223	1764
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	689	1247	199	914	179	658	780	65	159	1682	45
RTOR Reduction (vph)	0	0	0	0	0	41	0	0	43	0	0	6
Lane Group Flow (vph)	77	689	1247	199	914	138	658	780	22	159	1682	39
Confl. Peds. (#/hr)	1					1	9					9
Heavy Vehicles (%)	0%	7%	2%	2%	5%	1%	2%	2%	21%	1%	0%	0%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	40.0	34.0	145.0	49.6	38.8	75.4	27.8	37.5	48.3	36.6	45.7	51.7
Effective Green, g (s)	40.0	34.0	145.0	49.6	38.8	75.4	27.8	37.5	48.3	36.6	45.7	51.7
Actuated g/C Ratio	0.28	0.23	1.00	0.34	0.27	0.52	0.19	0.26	0.33	0.25	0.32	0.36
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	126	822	1785	198	956	931	652	947	499	439	1646	629
v/s Ratio Prot	0.03	0.20		c0.07	0.26	0.04	c0.19	0.21	0.00	0.09	c0.32	0.00
v/s Ratio Perm	0.14		c0.70	c0.27		0.04			0.01			0.02
v/c Ratio	0.61	0.84	0.70	1.01	0.96	0.15	1.01	0.82	0.04	0.36	1.02	0.06
Uniform Delay, d1	42.4	52.9	0.0	40.8	52.3	18.1	58.6	50.6	32.7	44.6	49.6	30.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	8.3	2.3	65.3	19.6	0.1	37.5	5.9	0.0	0.5	27.9	0.0
Delay (s)	50.9	61.2	2.3	106.0	71.8	18.2	96.1	56.5	32.8	45.1	77.5	30.7
Level of Service	D	E	A	F	E	B	F	E	C	D	E	C
Approach Delay (s)		24.3			69.7			72.8			73.7	
Approach LOS		C			E			E			E	

Intersection Summary

HCM Average Control Delay	57.9	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	19.7
Intersection Capacity Utilization	97.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↘
Volume (veh/h)	0	186	47	1423	2442	577
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	202	51	1547	2654	627
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked	0.80			377		
vC, conflicting volume	3843	1198	2654			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4057	1198	2654			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	68			
cM capacity (veh/h)	1	181	161			

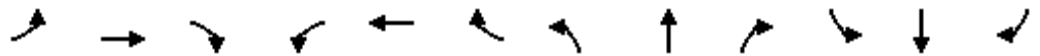
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	202	51	773	773	1062	1062	1158
Volume Left	0	51	0	0	0	0	0
Volume Right	202	0	0	0	0	0	627
cSH	181	161	1700	1700	1700	1700	1700
Volume to Capacity	1.12	0.32	0.45	0.45	0.62	0.62	0.68
Queue Length 95th (m)	76.9	9.7	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	154.4	37.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	154.4	1.2			0.0		
Approach LOS	F						

Intersection Summary						
Average Delay			6.5			
Intersection Capacity Utilization		78.2%		ICU Level of Service		D
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↗	↑↑	↖	↖↗	↑↑	↖	↖↗	↑↑	↖	↖	↑↑↑	↖
Volume (vph)	651	399	454	780	596	64	341	865	219	93	1646	691
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3770	1597	3390	3450	1594	3424	3622	1812	1725	5250	1830
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.19	1.00	1.00
Satd. Flow (perm)	3236	3770	1597	3390	3450	1594	3424	3622	1812	340	5250	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	708	434	493	848	648	70	371	940	238	101	1789	751
RTOR Reduction (vph)	0	0	2	0	0	12	0	0	52	0	0	0
Lane Group Flow (vph)	708	434	491	848	648	58	371	940	186	101	1789	751
Confl. Peds. (#/hr)	3		5	5		3						
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	3%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	29.6	20.9	40.1	35.2	26.6	35.8	19.2	55.9	91.1	54.9	45.7	145.0
Effective Green, g (s)	29.6	20.9	40.1	35.2	26.6	35.8	19.2	55.9	91.1	54.9	45.7	145.0
Actuated g/C Ratio	0.20	0.14	0.28	0.24	0.18	0.25	0.13	0.39	0.63	0.38	0.32	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	661	543	442	823	633	394	453	1396	1138	217	1655	1830
v/s Ratio Prot	c0.22	0.12	c0.15	c0.25	0.19	0.01	0.11	0.26	0.04	0.03	c0.34	
v/s Ratio Perm			0.16			0.03			0.06	0.15		0.41
v/c Ratio	1.07	0.80	1.11	1.03	1.02	0.15	0.82	0.67	0.16	0.47	1.08	0.41
Uniform Delay, d1	57.7	60.0	52.4	54.9	59.2	42.7	61.2	37.0	11.2	31.0	49.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	55.6	8.1	76.4	39.4	41.9	0.2	11.0	1.7	0.1	1.6	47.6	0.7
Delay (s)	113.3	68.1	128.8	94.3	101.1	42.8	72.2	38.7	11.2	32.6	97.2	0.7
Level of Service	F	E	F	F	F	D	E	D	B	C	F	A
Approach Delay (s)		106.0			94.8			42.5			67.3	
Approach LOS		F			F			D			E	

Intersection Summary		
HCM Average Control Delay	76.5	HCM Level of Service E
HCM Volume to Capacity ratio	1.10	
Actuated Cycle Length (s)	145.0	Sum of lost time (s) 24.4
Intersection Capacity Utilization	97.5%	ICU Level of Service F
Analysis Period (min)	15	

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↓↓	↙
Volume (veh/h)	0	181	68	1417	2521	216
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.92
Hourly flow rate (vph)	0	195	73	1524	2711	235
Pedestrians	1					
Lane Width (m)	4.8					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	3620	1356	2712			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3620	1356	2712			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	52			
cM capacity (veh/h)	2	140	153			

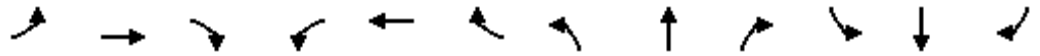
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	195	73	762	762	1355	1355	235
Volume Left	0	73	0	0	0	0	0
Volume Right	195	0	0	0	0	0	235
cSH	140	153	1700	1700	1700	1700	1700
Volume to Capacity	1.39	0.48	0.45	0.45	0.80	0.80	0.14
Queue Length 95th (m)	95.8	17.1	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	272.2	48.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	272.2	2.2			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		11.9	
Intersection Capacity Utilization	87.6%		ICU Level of Service E
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗		↖	↗	↘	↖	↗	↘
Volume (vph)	56	330	308	265	519	60	555	388	430	125	375	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1769	3542	1496	1732	3451		3385	3490	1682	1761	3418	
Flt Permitted	0.43	1.00	1.00	0.35	1.00		0.95	1.00	1.00	0.52	1.00	
Satd. Flow (perm)	794	3542	1496	631	3451		3385	3490	1682	957	3418	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	58	340	318	273	535	62	572	400	443	129	387	88
RTOR Reduction (vph)	0	0	86	0	7	0	0	0	102	0	16	0
Lane Group Flow (vph)	58	340	232	273	590	0	572	400	341	129	459	0
Confl. Peds. (#/hr)	6		13	13		6	11		6	6		11
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			Prot		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8					2	6		
Actuated Green, G (s)	22.8	18.2	40.7	38.3	27.7		22.5	35.3	49.4	27.0	19.9	
Effective Green, g (s)	22.8	18.2	40.7	38.3	27.7		22.5	35.3	49.4	27.0	19.9	
Actuated g/C Ratio	0.23	0.18	0.41	0.39	0.28		0.23	0.36	0.50	0.27	0.20	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	229	653	708	402	969		772	1248	944	320	689	
v/s Ratio Prot	0.01	0.10	0.07	c0.10	0.17		c0.17	0.11	0.05	0.03	c0.13	
v/s Ratio Perm	0.05		0.08	c0.17					0.15	0.08		
v/c Ratio	0.25	0.52	0.33	0.68	0.61		0.74	0.32	0.36	0.40	0.67	
Uniform Delay, d1	30.2	36.3	19.7	22.5	30.8		35.4	23.0	15.0	28.1	36.3	
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	0.6	1.0	0.3	4.5	1.3		3.8	0.2	0.2	0.8	2.7	
Delay (s)	30.8	37.3	20.0	27.0	32.1		39.2	23.2	15.3	28.9	39.0	
Level of Service	C	D	B	C	C		D	C	B	C	D	
Approach Delay (s)		29.1			30.5			27.2			36.9	
Approach LOS		C			C			C			D	

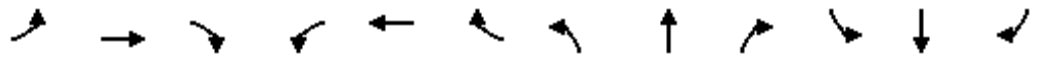
Intersection Summary

HCM Average Control Delay	30.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	98.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	80	380	96	86	437	400	114	358	113	241	363	99
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00	0.95	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.98	1.00		0.98	1.00	1.00	0.99	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.96		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	3325		1706	3733	1727	1741	1812		1812	2007	
Flt Permitted	0.39	1.00		0.35	1.00	1.00	0.46	1.00		0.17	1.00	
Satd. Flow (perm)	686	3325		628	3733	1727	840	1812		323	2007	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	95	452	114	102	520	476	136	426	135	287	432	118
RTOR Reduction (vph)	0	35	0	0	0	112	0	18	0	0	15	0
Lane Group Flow (vph)	95	531	0	102	520	364	136	543	0	287	535	0
Confl. Peds. (#/hr)	28		30	30		28	38		44	44		38
Heavy Vehicles (%)	2%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	2%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	15.2	15.2		15.2	15.2	22.3	21.8	21.8		33.9	33.9	
Effective Green, g (s)	15.2	15.2		15.2	15.2	22.3	21.8	21.8		33.9	33.9	
Actuated g/C Ratio	0.25	0.25		0.25	0.25	0.36	0.36	0.36		0.55	0.55	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	171	827		156	929	630	300	647		352	1114	
v/s Ratio Prot		0.16			0.14	0.07		0.30		c0.09	0.27	
v/s Ratio Perm	0.14			c0.16		0.14	0.16			c0.36		
v/c Ratio	0.56	0.64		0.65	0.56	0.58	0.45	0.84		0.82	0.48	
Uniform Delay, d1	20.0	20.5		20.6	20.0	15.6	15.1	18.0		10.6	8.3	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	1.9		10.4	0.9	1.5	1.5	9.8		14.2	0.4	
Delay (s)	24.8	22.4		31.0	20.9	17.2	16.6	27.8		24.8	8.7	
Level of Service	C	C		C	C	B	B	C		C	A	
Approach Delay (s)		22.8			20.2			25.6			14.2	
Approach LOS		C			C			C			B	

Intersection Summary

HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	61.1	Sum of lost time (s)	11.0
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Volume (vph)	21	117	109	3	228	184	60	148	6	127	277	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.93		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2043	1975		1921	1871		2029	2109		2022	2074	
Flt Permitted	0.32	1.00		0.58	1.00		0.43	1.00		0.63	1.00	
Satd. Flow (perm)	691	1975		1178	1871		920	2109		1348	2074	
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)	27	150	140	4	292	236	77	190	8	163	355	49
RTOR Reduction (vph)	0	84	0	0	73	0	0	4	0	0	14	0
Lane Group Flow (vph)	27	206	0	4	455	0	77	194	0	163	390	0
Confl. Peds. (#/hr)	3		3	3		3	24		2	2		24
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	3%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.8	12.8		12.8	12.8		11.3	11.3		11.3	11.3	
Effective Green, g (s)	12.8	12.8		12.8	12.8		11.3	11.3		11.3	11.3	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.35	0.35		0.35	0.35	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	276	788		470	746		324	742		475	730	
v/s Ratio Prot		0.10			c0.24			0.09			c0.19	
v/s Ratio Perm	0.04			0.00			0.08			0.12		
v/c Ratio	0.10	0.26		0.01	0.61		0.24	0.26		0.34	0.53	
Uniform Delay, d1	6.0	6.5		5.8	7.7		7.4	7.4		7.7	8.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.0	1.5		0.4	0.2		0.4	0.8	
Delay (s)	6.2	6.7		5.8	9.2		7.7	7.6		8.1	9.1	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		6.6			9.1			7.6			8.8	
Approach LOS		A			A			A			A	

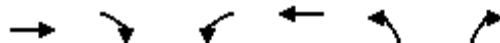
Intersection Summary

HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	32.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↑↑	↑	↑↑	↑↑		↑	
Volume (veh/h)	872	123	443	612	0	205	
Sign Control	Free			Free	Stop		
Grade	-1%			4%	-2%		
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	
Hourly flow rate (vph)	1051	148	534	737	0	247	
Pedestrians	159			2	12		
Lane Width (m)	3.8			3.8	4.2		
Walking Speed (m/s)	1.2			1.2	1.2		
Percent Blockage	14			0	1		
Right turn flare (veh)							
Median type	Raised			Raised			
Median storage veh	1			1			
Upstream signal (m)	207						
pX, platoon unblocked				0.95	0.95	0.95	
vC, conflicting volume				1063	2658	539	
vC1, stage 1 conf vol					1063		
vC2, stage 2 conf vol					1595		
vCu, unblocked vol				958	2639	406	
tC, single (s)				4.1	6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)				2.2	3.5	3.3	
p0 queue free %				22	100	56	
cM capacity (veh/h)				681	25	562	

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	525	525	148	267	267	369	369	247
Volume Left	0	0	0	267	267	0	0	0
Volume Right	0	0	148	0	0	0	0	247
cSH	1700	1700	1700	681	681	1700	1700	562
Volume to Capacity	0.31	0.31	0.09	0.78	0.78	0.22	0.22	0.44
Queue Length 95th (m)	0.0	0.0	0.0	58.3	58.3	0.0	0.0	16.9
Control Delay (s)	0.0	0.0	0.0	26.7	26.7	0.0	0.0	16.3
Lane LOS				D	D	C		
Approach Delay (s)	0.0			11.2			16.3	
Approach LOS							C	

Intersection Summary

Average Delay	6.7							
Intersection Capacity Utilization	50.7%			ICU Level of Service				A
Analysis Period (min)	15							

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	141	409	264	724	556	192	260	52	336	360	13	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	1.00	0.91	0.91	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	0.99		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98	0.85	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1809	3542	1535	3657	3584		1860	1984	1679	3657	1984	1681
Flt Permitted	0.30	1.00	1.00	0.95	1.00		0.69	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	579	3542	1535	3657	3584		1351	1984	1679	3657	1984	1681
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	160	465	300	823	632	218	295	59	382	409	15	159
RTOR Reduction (vph)	0	12	131	0	36	0	0	0	27	0	0	110
Lane Group Flow (vph)	160	522	100	823	814	0	295	59	355	409	15	49
Confl. Peds. (#/hr)	14					14	7		4	4		7
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Turn Type	pm+pt		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases	4		4				2		2			6
Actuated Green, G (s)	23.5	15.4	29.0	15.5	22.8		19.4	7.1	22.6	8.3	1.8	9.9
Effective Green, g (s)	23.5	15.4	29.0	15.5	22.8		19.4	7.1	22.6	8.3	1.8	9.9
Actuated g/C Ratio	0.35	0.23	0.43	0.23	0.34		0.29	0.11	0.34	0.12	0.03	0.15
Clearance Time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	350	811	661	842	1214		492	209	564	451	53	247
v/s Ratio Prot	0.05	0.15	0.03	c0.23	c0.23		c0.12	0.03	c0.14	c0.11	0.01	0.02
v/s Ratio Perm	0.10		0.03				0.05		0.07			0.01
v/c Ratio	0.46	0.64	0.15	0.98	0.67		0.60	0.28	0.63	0.91	0.28	0.20
Uniform Delay, d1	15.7	23.5	11.7	25.7	19.0		20.3	27.8	18.8	29.1	32.1	25.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	2.0	0.1	25.4	1.6		2.0	1.0	2.5	21.6	4.0	0.5
Delay (s)	16.9	25.4	11.8	51.1	20.6		22.3	28.8	21.3	50.7	36.1	25.8
Level of Service	B	C	B	D	C		C	C	C	D	D	C
Approach Delay (s)		20.5			35.6			22.3			43.5	
Approach LOS		C			D			C			D	

Intersection Summary

HCM Average Control Delay	30.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	67.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	113	95	55	170	23	143	67	13	72	27	104
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.98		1.00	0.98		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1888		1945	2110		2046	1803		1750	1622	
Flt Permitted	0.63	1.00		0.62	1.00		0.80	1.00		0.80	1.00	
Satd. Flow (perm)	1154	1888		1264	2110		1723	1803		1474	1622	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	123	103	60	185	25	155	73	14	78	29	113
RTOR Reduction (vph)	0	53	0	0	10	0	0	11	0	0	90	0
Lane Group Flow (vph)	32	173	0	60	200	0	155	76	0	78	52	0
Confl. Peds. (#/hr)			3	3								
Heavy Vehicles (%)	2%	0%	0%	5%	0%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.1	12.1		12.1	12.1		5.0	5.0		5.0	5.0	
Effective Green, g (s)	12.1	12.1		12.1	12.1		5.0	5.0		5.0	5.0	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.20	0.20		0.20	0.20	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	556	910		609	1017		343	359		294	323	
v/s Ratio Prot		0.09			c0.09			0.04			0.03	
v/s Ratio Perm	0.03			0.05			c0.09			0.05		
v/c Ratio	0.06	0.19		0.10	0.20		0.45	0.21		0.27	0.16	
Uniform Delay, d1	3.5	3.7		3.5	3.7		8.8	8.4		8.5	8.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.1		0.1	0.1		0.9	0.3		0.5	0.2	
Delay (s)	3.5	3.8		3.6	3.8		9.8	8.7		9.0	8.5	
Level of Service	A	A		A	A		A	A		A	A	
Approach Delay (s)		3.8			3.8			9.4			8.7	
Approach LOS		A			A			A			A	

Intersection Summary

HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	25.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	38	500	863	28	221	719
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%		0%			-1%
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	1.00
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1750	1566	3484		1759	1851
Flt Permitted	0.95	1.00	1.00		0.19	1.00
Satd. Flow (perm)	1750	1566	3484		358	1851
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	543	938	30	240	782
RTOR Reduction (vph)	0	19	4	0	0	0
Lane Group Flow (vph)	41	524	964	0	240	782
Turn Type		pm+ov			pm+pt	
Protected Phases	8	1	2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	2.4	14.0	16.7		32.3	32.3
Effective Green, g (s)	2.4	14.0	16.7		32.3	32.3
Actuated g/C Ratio	0.06	0.33	0.39		0.76	0.76
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	98	660	1363		651	1400
v/s Ratio Prot	0.02	c0.22	c0.28		0.10	0.42
v/s Ratio Perm		0.12			0.18	
v/c Ratio	0.42	0.79	0.71		0.37	0.56
Uniform Delay, d1	19.5	13.0	10.9		3.3	2.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.9	6.5	1.7		0.4	0.5
Delay (s)	22.4	19.5	12.6		3.7	2.7
Level of Service	C	B	B		A	A
Approach Delay (s)	19.7		12.6			2.9
Approach LOS	B		B			A

Intersection Summary

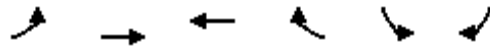
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	42.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	1503	802	87	0	65
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1634	872	95	0	71
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.88	
vC, conflicting volume	966				1736	265
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	966				1559	265
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	708				90	733

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	817	817	249	249	249	219	71
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	95	71
cSH	1700	1700	1700	1700	1700	1700	733
Volume to Capacity	0.48	0.48	0.15	0.15	0.15	0.13	0.10
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	2.4
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.4
Lane LOS							B
Approach Delay (s)	0.0		0.0				10.4
Approach LOS							B

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization	44.9%		ICU Level of Service A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↷		↶	↷
Volume (veh/h)	4	8	882	13	13	745
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	9	959	14	14	810
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2			2
Upstream signal (m)						178
pX, platoon unblocked	0.78					
vC, conflicting volume	1804	966			973	
vC1, stage 1 conf vol	966					
vC2, stage 2 conf vol	838					
vCu, unblocked vol	1888	966			973	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	97			98	
cM capacity (veh/h)	268	309			709	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	13	973	14	810
Volume Left	4	0	14	0
Volume Right	9	14	0	0
cSH	463	1700	709	1700
Volume to Capacity	0.03	0.57	0.02	0.48
Queue Length 95th (m)	0.7	0.0	0.5	0.0
Control Delay (s)	17.5	0.0	10.2	0.0
Lane LOS	C		B	
Approach Delay (s)	17.5	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	13	882	16	12	738
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	14	959	17	13	802
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)			265			
pX, platoon unblocked	0.81	0.81			0.81	
vC, conflicting volume	1796	967			976	
vC1, stage 1 conf vol	967					
vC2, stage 2 conf vol	828					
vCu, unblocked vol	1867	839			850	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	95			98	
cM capacity (veh/h)	264	295			635	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	23	976	13	802
Volume Left	9	0	13	0
Volume Right	14	17	0	0
cSH	476	1700	635	1700
Volume to Capacity	0.05	0.57	0.02	0.47
Queue Length 95th (m)	1.1	0.0	0.5	0.0
Control Delay (s)	18.3	0.0	10.8	0.0
Lane LOS	C		B	
Approach Delay (s)	18.3	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		57.4%	ICU Level of Service B
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔		↗	↘		↗	↘	
Volume (vph)	61	692	48	63	814	80	53	0	65	58	0	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.85		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3455			3445		1750	1566		1750	1566	
Flt Permitted		0.84			0.86		0.89	1.00		0.89	1.00	
Satd. Flow (perm)		2903			2986		1637	1566		1637	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	66	752	52	68	885	87	58	0	71	63	0	91
RTOR Reduction (vph)	0	7	0	0	10	0	0	62	0	0	77	0
Lane Group Flow (vph)	0	863	0	0	1030	0	58	9	0	63	14	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		22.4			22.4		4.5	4.5		4.5	4.5	
Effective Green, g (s)		22.4			22.4		4.5	4.5		4.5	4.5	
Actuated g/C Ratio		0.64			0.64		0.13	0.13		0.13	0.13	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1863			1917		211	202		211	202	
v/s Ratio Prot								0.01				0.01
v/s Ratio Perm		0.30			0.34		0.04			0.04		
v/c Ratio		0.46			0.54		0.27	0.05		0.30	0.07	
Uniform Delay, d1		3.2			3.4		13.7	13.3		13.8	13.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			0.3		0.7	0.1		0.8	0.1	
Delay (s)		3.4			3.7		14.4	13.4		14.6	13.5	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		3.4			3.7			13.9			13.9	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	4.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	34.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

1: Hwy 97 S & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↗↗	↘	↘	↗↗	↘	↗↗	↗↗	↘	↘	↗↗↗	↘
Volume (vph)	89	484	1445	140	500	131	781	906	34	91	1430	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.6	4.0	4.8	3.7	4.0	4.8	3.6	4.0	4.8	3.5	3.8	4.8
Grade (%)		1%			1%			2%			3%	
Total Lost time (s)	5.5	7.0	4.0	5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frft	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1727	3642	1821	1763	3573	1808	3467	3696	1523	1707	5171	1780
Flt Permitted	0.21	1.00	1.00	0.23	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	379	3642	1821	419	3573	1808	3467	3696	1523	1707	5171	1780
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	102	556	1661	161	575	151	898	1041	39	105	1644	67
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	24	0	0	14
Lane Group Flow (vph)	102	556	1661	161	575	114	898	1041	15	105	1644	53
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	4%	3%	0%	3%	5%	0%	0%	1%	19%	3%	1%	0%
Turn Type	pm+pt		Free	pm+pt		pm+ov	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases	4		Free	8		8			2			6
Actuated Green, G (s)	35.7	29.6	140.6	35.7	29.6	60.9	34.8	47.5	53.6	31.3	43.4	49.5
Effective Green, g (s)	35.7	29.6	140.6	35.7	29.6	60.9	34.8	47.5	53.6	31.3	43.4	49.5
Actuated g/C Ratio	0.25	0.21	1.00	0.25	0.21	0.43	0.25	0.34	0.38	0.22	0.31	0.35
Clearance Time (s)	5.5	7.0		5.5	7.0	7.0	7.6	6.6	5.5	7.0	6.6	5.5
Vehicle Extension (s)	3.0	5.0		3.0	5.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	155	767	1821	165	752	783	858	1249	581	380	1596	627
v/s Ratio Prot	0.03	0.15		0.04	0.16	0.03	0.26	0.28	0.00	0.06	c0.32	0.00
v/s Ratio Perm	0.14		c0.91	0.21		0.03			0.01			0.03
v/c Ratio	0.66	0.72	0.91	0.98	0.76	0.15	1.05	0.83	0.03	0.28	1.03	0.08
Uniform Delay, d1	43.6	51.7	0.0	50.7	52.2	24.1	52.9	42.9	27.2	45.3	48.6	30.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.7	4.2	8.5	62.3	5.5	0.1	43.6	4.9	0.0	0.4	30.6	0.1
Delay (s)	53.2	55.9	8.5	113.0	57.7	24.2	96.5	47.8	27.2	45.7	79.2	30.5
Level of Service	D	E	A	F	E	C	F	D	C	D	E	C
Approach Delay (s)		21.8			62.0			69.5			75.5	
Approach LOS		C			E			E			E	

Intersection Summary

HCM Average Control Delay	54.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	140.6	Sum of lost time (s)	0.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Playhouse Access Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↕	↕	↘
Volume (veh/h)	0	260	65	1889	2184	844
Sign Control	Stop			Free	Free	
Grade	-5%			0%	-1%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	280	70	2031	2348	908
Pedestrians				2	1	
Lane Width (m)				3.8	3.4	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				377		
pX, platoon unblocked	0.71					
vC, conflicting volume	3959	1239	2348			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4351	1239	2348			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	0	67			
cM capacity (veh/h)	1	170	212			

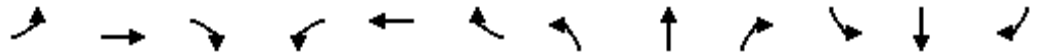
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	280	70	1016	1016	939	939	1377
Volume Left	0	70	0	0	0	0	0
Volume Right	280	0	0	0	0	0	908
cSH	170	212	1700	1700	1700	1700	1700
Volume to Capacity	1.65	0.33	0.60	0.60	0.55	0.55	0.81
Queue Length 95th (m)	145.7	10.4	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	363.1	30.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	363.1	1.0			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		18.4	
Intersection Capacity Utilization	84.0%		ICU Level of Service E
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis

3: Ferry Ave & Hwy 16 W

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	753	335	366	329	484	43	578	1021	266	81	1280	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	4.0	3.6	3.4	3.2	3.6	3.4	3.9	4.8	3.2	3.8	4.8
Total Lost time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.91	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3236	3733	1604	3390	3450	1615	3390	3693	1812	1725	5250	1808
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.11	1.00	1.00
Satd. Flow (perm)	3236	3733	1604	3390	3450	1615	3390	3693	1812	202	5250	1808
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	846	376	411	370	544	48	649	1147	299	91	1438	933
RTOR Reduction (vph)	0	0	14	0	0	10	0	0	57	0	0	0
Lane Group Flow (vph)	846	376	397	370	544	38	649	1147	242	91	1438	933
Confl. Peds. (#/hr)			2	2			1					1
Heavy Vehicles (%)	1%	1%	0%	1%	0%	0%	1%	1%	1%	0%	1%	0%
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		pm+ov	pm+pt		Free
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	
Permitted Phases			4			8			2	6		Free
Actuated Green, G (s)	35.1	19.9	45.9	39.1	24.0	31.4	26.0	54.8	93.9	43.4	36.0	145.0
Effective Green, g (s)	35.1	19.9	45.9	39.1	24.0	31.4	26.0	54.8	93.9	43.4	36.0	145.0
Actuated g/C Ratio	0.24	0.14	0.32	0.27	0.17	0.22	0.18	0.38	0.65	0.30	0.25	1.00
Clearance Time (s)	6.2	5.8	5.9	6.3	5.8	5.7	5.9	6.0	6.3	5.7	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	3.0	3.0	5.0	
Lane Grp Cap (vph)	783	512	508	914	571	350	608	1396	1173	138	1303	1808
v/s Ratio Prot	c0.26	0.10	0.14	0.11	c0.16	0.01	c0.19	0.31	0.06	0.03	c0.27	
v/s Ratio Perm			0.11			0.02			0.08	0.16		0.52
v/c Ratio	1.08	0.73	0.78	0.40	0.95	0.11	1.07	0.82	0.21	0.66	1.10	0.52
Uniform Delay, d1	55.0	60.0	45.0	43.4	59.9	45.6	59.5	40.7	10.4	39.4	54.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	56.1	5.4	7.7	0.3	26.2	0.1	55.8	4.5	0.1	10.8	58.4	1.1
Delay (s)	111.1	65.4	52.7	43.7	86.1	45.7	115.3	45.2	10.5	50.3	112.9	1.1
Level of Service	F	E	D	D	F	D	F	D	B	D	F	A
Approach Delay (s)		85.9			67.8			62.0			68.2	
Approach LOS		F			E			E			E	

Intersection Summary

HCM Average Control Delay	70.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	23.9
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

4: Range Rd & Hwy 16 W

2008/10/28



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↖	↑↑	↑↑	↖
Volume (veh/h)	0	192	83	1590	1545	304
Sign Control	Stop			Free	Free	
Grade	1%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	213	92	1767	1717	338
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2784	858	1717			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2784	858	1717			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	29	74			
cM capacity (veh/h)	12	302	361			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	213	92	883	883	858	858	338
Volume Left	0	92	0	0	0	0	0
Volume Right	213	0	0	0	0	0	338
cSH	302	361	1700	1700	1700	1700	1700
Volume to Capacity	0.71	0.26	0.52	0.52	0.50	0.50	0.20
Queue Length 95th (m)	37.9	7.6	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	41.2	18.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	C					
Approach Delay (s)	41.2	0.9			0.0		
Approach LOS	E						

Intersection Summary			
Average Delay		2.5	
Intersection Capacity Utilization	61.3%		ICU Level of Service B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

5: Massey Dr & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	384	344	109	225	29	659	442	523	208	493	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.0	3.3	3.4	3.4	3.3	3.3	4.2	3.4	3.4	4.0
Grade (%)		-3%			1%			0%				0%
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	0.99	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1760	3507	1483	1735	3407		3385	3455	1723	1747	3455	
Flt Permitted	0.48	1.00	1.00	0.19	1.00		0.95	1.00	1.00	0.42	1.00	
Satd. Flow (perm)	887	3507	1483	349	3407		3385	3455	1723	778	3455	
Peak-hour factor, PHF	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Adj. Flow (vph)	96	526	471	149	308	40	903	605	716	285	675	97
RTOR Reduction (vph)	0	0	18	0	7	0	0	0	60	0	8	0
Lane Group Flow (vph)	96	526	453	149	341	0	903	605	656	285	764	0
Confl. Peds. (#/hr)	14		11	11		14	5					5
Heavy Vehicles (%)	0%	1%	2%	0%	1%	0%	0%	1%	0%	1%	0%	0%
Turn Type	pm+pt		pm+ov	pm+pt			Prot		pm+ov	pm+pt		
Protected Phases	7	4	5	3	8		5	2	3	1	6	
Permitted Phases	4		4	8					2	6		
Actuated Green, G (s)	32.2	26.1	70.2	38.2	29.1		44.1	60.1	69.2	48.8	32.4	
Effective Green, g (s)	32.2	26.1	70.2	38.2	29.1		44.1	60.1	69.2	48.8	32.4	
Actuated g/C Ratio	0.24	0.19	0.52	0.28	0.21		0.32	0.44	0.51	0.36	0.24	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	4.0	3.0	3.0	4.0		3.0	4.0	3.0	3.0	4.0	
Lane Grp Cap (vph)	250	675	833	191	731		1100	1530	955	397	825	
v/s Ratio Prot	0.02	0.15	0.18	0.05	0.10		c0.27	0.18	c0.05	0.09	c0.22	
v/s Ratio Perm	0.07		0.13	c0.17					0.33	0.17		
v/c Ratio	0.38	0.78	0.54	0.78	0.47		0.82	0.40	0.69	0.72	0.93	
Uniform Delay, d1	41.8	52.1	22.0	39.7	46.5		42.2	25.5	25.1	33.3	50.5	
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	1.0	6.0	0.7	18.4	0.6		5.0	0.2	2.1	6.1	16.3	
Delay (s)	42.8	58.1	22.7	58.1	47.2		47.2	25.8	27.2	39.4	66.8	
Level of Service	D	E	C	E	D		D	C	C	D	E	
Approach Delay (s)		41.5			50.4			34.9			59.4	
Approach LOS		D			D			C			E	

Intersection Summary

HCM Average Control Delay	43.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	135.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

6: Ferry Ave & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↗		↖	↗	
Volume (vph)	77	436	11	74	499	554	20	447	160	331	343	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.2	3.3	3.3	3.3	4.0	4.8	3.4	3.6	3.6	3.6	4.5	4.5
Grade (%)		-1%			0%			0%				-1%
Total Lost time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00	0.98	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1724	3492		1736	3733	1797	1762	1817		1814	2048	
Flt Permitted	0.37	1.00		0.42	1.00	1.00	0.52	1.00		0.14	1.00	
Satd. Flow (perm)	665	3492		771	3733	1797	965	1817		261	2048	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	79	445	11	76	509	565	20	456	163	338	350	63
RTOR Reduction (vph)	0	2	0	0	0	120	0	19	0	0	9	0
Lane Group Flow (vph)	79	454	0	76	509	445	20	600	0	338	404	0
Confl. Peds. (#/hr)	6		5	5		6	4		6	6		4
Heavy Vehicles (%)	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm			Perm		pm+ov	Perm			pm+pt		
Protected Phases		4			8	1		2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)	14.9	14.9		14.9	14.9	25.9	24.3	24.3		40.3	40.3	
Effective Green, g (s)	14.9	14.9		14.9	14.9	25.9	24.3	24.3		40.3	40.3	
Actuated g/C Ratio	0.22	0.22		0.22	0.22	0.39	0.36	0.36		0.60	0.60	
Clearance Time (s)	6.0	6.0		6.0	6.0	5.0	6.0	6.0		5.0	6.0	
Vehicle Extension (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Grp Cap (vph)	147	774		171	828	693	349	657		411	1228	
v/s Ratio Prot		0.13			0.14	c0.11		c0.33		c0.13	0.20	
v/s Ratio Perm	0.12			0.10		0.14	0.02			0.36		
v/c Ratio	0.54	0.59		0.44	0.61	0.64	0.06	0.91		0.82	0.33	
Uniform Delay, d1	23.1	23.4		22.6	23.6	16.9	14.0	20.5		15.1	6.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	1.3		2.5	1.6	2.3	0.1	17.5		13.0	0.2	
Delay (s)	27.9	24.7		25.1	25.1	19.1	14.1	38.0		28.1	6.9	
Level of Service	C	C		C	C	B	B	D		C	A	
Approach Delay (s)		25.2			22.2			37.2			16.5	
Approach LOS		C			C			D			B	

Intersection Summary

HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	67.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

7: Range Rd & Westwood Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	178	79	3	248	424	95	227	3	174	190	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.8	4.8	4.8	4.2	4.2	4.2	4.8	4.8	4.8	4.8	4.8	4.8
Grade (%)		0%			0%			-1%				2%
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.98	1.00	
Frt	1.00	0.95		1.00	0.91		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	2044	2040		1922	1809		2056	2159		1981	2117	
Flt Permitted	0.23	1.00		0.59	1.00		0.62	1.00		0.59	1.00	
Satd. Flow (perm)	505	2040		1194	1809		1351	2159		1235	2117	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	33	191	85	3	267	456	102	244	3	187	204	10
RTOR Reduction (vph)	0	32	0	0	123	0	0	1	0	0	4	0
Lane Group Flow (vph)	33	244	0	3	600	0	102	246	0	187	210	0
Confl. Peds. (#/hr)	2		2	2		2			28	28		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	18.4	18.4		18.4	18.4		8.9	8.9		8.9	8.9	
Effective Green, g (s)	18.4	18.4		18.4	18.4		8.9	8.9		8.9	8.9	
Actuated g/C Ratio	0.52	0.52		0.52	0.52		0.25	0.25		0.25	0.25	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	263	1063		622	943		341	544		311	534	
v/s Ratio Prot		0.12			c0.33			0.11			0.10	
v/s Ratio Perm	0.07			0.00			0.08			c0.15		
v/c Ratio	0.13	0.23		0.00	0.64		0.30	0.45		0.60	0.39	
Uniform Delay, d1	4.3	4.6		4.1	6.1		10.7	11.1		11.6	11.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.1		0.0	1.4		0.5	0.6		3.3	0.5	
Delay (s)	4.5	4.7		4.1	7.5		11.2	11.7		14.9	11.4	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		4.7			7.5			11.6			13.0	
Approach LOS		A			A			B			B	

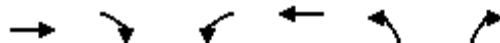
Intersection Summary

HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	35.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

8: Massey Dr & Pine Centre Frontage Rd

2008/10/28



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑↓	↑↑		↑
Volume (veh/h)	960	183	575	434	0	308
Sign Control	Free			Free	Stop	
Grade	-1%			4%	-2%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1043	199	625	472	0	335
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised		Raised			
Median storage veh	1		1			
Upstream signal (m)	207					
pX, platoon unblocked			0.91		0.91	0.91
vC, conflicting volume			1043		2529	522
vC1, stage 1 conf vol					1043	
vC2, stage 2 conf vol					1486	
vCu, unblocked vol			858		2485	287
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			14		100	49
cM capacity (veh/h)			723		21	654

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	WB 4	NB 1
Volume Total	522	522	199	312	312	236	236	335
Volume Left	0	0	0	312	312	0	0	0
Volume Right	0	0	199	0	0	0	0	335
cSH	1700	1700	1700	723	723	1700	1700	654
Volume to Capacity	0.31	0.31	0.12	0.86	0.86	0.14	0.14	0.51
Queue Length 95th (m)	0.0	0.0	0.0	78.8	78.8	0.0	0.0	22.3
Control Delay (s)	0.0	0.0	0.0	33.1	33.1	0.0	0.0	16.1
Lane LOS				D	D	C		
Approach Delay (s)	0.0			18.8				16.1
Approach LOS								C

Intersection Summary

Average Delay	9.7	
Intersection Capacity Utilization	52.3%	ICU Level of Service A
Analysis Period (min)	15	

HCM Signalized Intersection Capacity Analysis

10: Ferry Ave & RecPlace Dr

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	435	355	984	641	289	323	77	425	481	21	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total Lost time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95		1.00	1.00	1.00	0.97	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1885	3733	1668	3657	3595		1884	1984	1681	3657	1984	1679
Flt Permitted	0.19	1.00	1.00	0.95	1.00		0.53	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	376	3733	1668	3657	3595		1044	1984	1681	3657	1984	1679
Peak-hour factor, PHF	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Adj. Flow (vph)	283	572	467	1295	843	380	425	101	559	633	28	346
RTOR Reduction (vph)	0	0	209	0	35	0	0	0	3	0	0	60
Lane Group Flow (vph)	283	572	258	1295	1188	0	425	101	556	633	28	286
Confl. Peds. (#/hr)			7	7			1		1	1		1
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt		pm+ov	Prot			pm+pt		pm+ov	Prot		pm+ov
Protected Phases	7	4	5	3	8		5	2	3	1	6	7
Permitted Phases	4		4				2		2			6
Actuated Green, G (s)	39.0	21.1	50.4	48.0	51.2		43.2	15.2	63.2	24.0	9.9	27.8
Effective Green, g (s)	39.0	21.1	50.4	48.0	51.2		43.2	15.2	63.2	24.0	9.9	27.8
Actuated g/C Ratio	0.30	0.16	0.39	0.37	0.40		0.33	0.12	0.49	0.19	0.08	0.22
Clearance Time (s)	5.0	6.0	4.0	5.0	6.0		4.0	6.0	5.0	4.0	6.0	5.0
Vehicle Extension (s)	4.0	4.0	3.0	4.0	4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	322	609	650	1358	1424		539	233	822	679	152	361
v/s Ratio Prot	0.12	c0.15	0.09	c0.35	0.33		c0.18	0.05	0.25	c0.17	0.01	0.11
v/s Ratio Perm	0.14		0.06				c0.08		0.08			0.06
v/c Ratio	0.88	0.94	0.40	0.95	0.83		0.79	0.43	0.68	0.93	0.18	0.79
Uniform Delay, d1	37.5	53.5	28.5	39.6	35.2		37.1	53.0	25.2	51.8	55.9	48.0
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.3	22.6	0.4	14.8	4.6		7.5	1.8	2.4	19.7	0.8	11.8
Delay (s)	60.8	76.0	28.9	54.4	39.8		44.6	54.8	27.7	71.5	56.7	59.8
Level of Service	E	E	C	D	D		D	D	C	E	E	E
Approach Delay (s)		56.1			47.3			36.8			67.1	
Approach LOS		E			D			D			E	

Intersection Summary

HCM Average Control Delay	50.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	129.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

11: Range Rd & Wiebe Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	140	192	28	259	34	311	96	31	91	35	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	4.3	4.3	4.8	4.8	3.5	4.8	3.5	4.8	3.5	3.5	3.5
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	0.98		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.91		1.00	0.98		1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1840		2037	2114		2046	1779		1750	1623	
Flt Permitted	0.51	1.00		0.44	1.00		0.64	1.00		0.67	1.00	
Satd. Flow (perm)	939	1840		954	2114		1383	1779		1229	1623	
Peak-hour factor, PHF	0.92	0.84	0.84	0.84	0.84	0.92	0.84	0.92	0.84	0.92	0.92	0.92
Adj. Flow (vph)	46	167	229	33	308	37	370	104	37	99	38	145
RTOR Reduction (vph)	0	131	0	0	11	0	0	22	0	0	88	0
Lane Group Flow (vph)	46	265	0	33	334	0	370	119	0	99	95	0
Confl. Peds. (#/hr)			8	8								
Heavy Vehicles (%)	2%	0%	0%	0%	0%	2%	0%	2%	0%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.0	12.0		12.0	12.0		12.9	12.9		12.9	12.9	
Effective Green, g (s)	12.0	12.0		12.0	12.0		12.9	12.9		12.9	12.9	
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.39	0.39		0.39	0.39	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	342	671		348	771		542	698		482	636	
v/s Ratio Prot		0.14			c0.16			0.07			0.06	
v/s Ratio Perm	0.05			0.03			c0.27			0.08		
v/c Ratio	0.13	0.40		0.09	0.43		0.68	0.17		0.21	0.15	
Uniform Delay, d1	7.0	7.8		6.9	7.9		8.3	6.5		6.6	6.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.4		0.1	0.4		3.5	0.1		0.2	0.1	
Delay (s)	7.2	8.1		7.0	8.3		11.8	6.6		6.8	6.6	
Level of Service	A	A		A	A		B	A		A	A	
Approach Delay (s)		8.0			8.2			10.4			6.7	
Approach LOS		A			A			B			A	

Intersection Summary

HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	32.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

12: Athlone Ave & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	46	620	1051	36	299	692
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	1.00
Frt	1.00	0.85	1.00		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1750	1566	3483		1750	1842
Flt Permitted	0.95	1.00	1.00		0.14	1.00
Satd. Flow (perm)	1750	1566	3483		258	1842
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	674	1142	39	325	752
RTOR Reduction (vph)	0	10	3	0	0	0
Lane Group Flow (vph)	50	664	1178	0	325	752
Turn Type		pm+ov			pm+pt	
Protected Phases	8	1	2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	4.4	24.1	24.6		48.3	48.3
Effective Green, g (s)	4.4	24.1	24.6		48.3	48.3
Actuated g/C Ratio	0.07	0.40	0.41		0.80	0.80
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	127	725	1412		690	1466
v/s Ratio Prot	0.03	c0.30	c0.34		0.15	0.41
v/s Ratio Perm		0.13			0.22	
v/c Ratio	0.39	0.92	0.83		0.47	0.51
Uniform Delay, d1	26.9	17.3	16.2		8.1	2.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.0	16.2	4.4		0.5	0.3
Delay (s)	28.9	33.5	20.6		8.6	2.4
Level of Service	C	C	C		A	A
Approach Delay (s)	33.2		20.6			4.3
Approach LOS	C		C			A

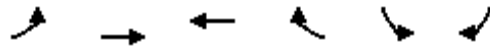
Intersection Summary

HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	60.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

13: Ferry Ave & Anthem Dr

2008/10/28



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑↑↑			↗
Volume (veh/h)	0	1454	798	135	0	93
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1580	867	147	0	101
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)		59	162			
pX, platoon unblocked					0.85	
vC, conflicting volume	1014				1731	290
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1014				1511	290
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	86
cM capacity (veh/h)	680				95	706

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	WB 4	SB 1
Volume Total	790	790	248	248	248	271	101
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	147	101
cSH	1700	1700	1700	1700	1700	1700	706
Volume to Capacity	0.46	0.46	0.15	0.15	0.15	0.16	0.14
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	3.8
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	10.9
Lane LOS							B
Approach Delay (s)	0.0		0.0				10.9
Approach LOS							B

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization	43.5%		ICU Level of Service A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
 14: Fairview Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	13	1074	12	11	726
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	14	1167	13	12	789
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2			2
Upstream signal (m)						178
pX, platoon unblocked	0.83					
vC, conflicting volume	1987	1174			1180	
vC1, stage 1 conf vol	1174					
vC2, stage 2 conf vol	813					
vCu, unblocked vol	2084	1174			1180	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	94			98	
cM capacity (veh/h)	235	234			592	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	21	1180	12	789
Volume Left	7	0	12	0
Volume Right	14	13	0	0
cSH	341	1700	592	1700
Volume to Capacity	0.06	0.69	0.02	0.46
Queue Length 95th (m)	1.5	0.0	0.5	0.0
Control Delay (s)	21.2	0.0	11.2	0.0
Lane LOS	C		B	
Approach Delay (s)	21.2	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		67.3%	ICU Level of Service C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 15: Laurel Cres & Westwood Dr

2008/10/28



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	12	21	1065	13	10	723
Sign Control	Stop		Free			Free
Grade	0%		0%			-1%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	23	1158	14	11	786
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (m)			265			
pX, platoon unblocked	0.76	0.76			0.76	
vC, conflicting volume	1972	1165			1172	
vC1, stage 1 conf vol	1165					
vC2, stage 2 conf vol	808					
vCu, unblocked vol	2125	1056			1066	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	89			98	
cM capacity (veh/h)	213	207			494	

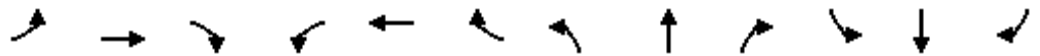
Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	36	1172	11	786
Volume Left	13	0	11	0
Volume Right	23	14	0	0
cSH	325	1700	494	1700
Volume to Capacity	0.11	0.69	0.02	0.46
Queue Length 95th (m)	2.8	0.0	0.5	0.0
Control Delay (s)	24.0	0.0	12.4	0.0
Lane LOS	C		B	
Approach Delay (s)	24.0	0.0	0.2	
Approach LOS	C			

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization	66.8%		ICU Level of Service C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

16: Ferry Ave & Ryan Rd

2008/10/28



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↗	↘		↗	↘	
Volume (vph)	75	845	62	82	1046	99	69	0	84	75	0	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.99			0.99		1.00	0.85		1.00	0.85	
Flt Protected		1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3454			3446		1750	1566		1750	1566	
Flt Permitted		0.78			0.82		0.68	1.00		0.70	1.00	
Satd. Flow (perm)		2688			2822		1255	1566		1286	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	82	918	67	89	1137	108	75	0	91	82	0	118
RTOR Reduction (vph)	0	7	0	0	9	0	0	77	0	0	75	0
Lane Group Flow (vph)	0	1060	0	0	1325	0	75	14	0	82	43	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.9			30.9		7.0	7.0		7.0	7.0	
Effective Green, g (s)		30.9			30.9		7.0	7.0		7.0	7.0	
Actuated g/C Ratio		0.67			0.67		0.15	0.15		0.15	0.15	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1810			1900		191	239		196	239	
v/s Ratio Prot								0.01			0.03	
v/s Ratio Perm		0.39			0.47		0.06			0.06		
v/c Ratio		0.59			0.70		0.39	0.06		0.42	0.18	
Uniform Delay, d1		4.0			4.6		17.5	16.6		17.6	17.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5			1.1		1.3	0.1		1.4	0.4	
Delay (s)		4.5			5.8		18.9	16.7		19.1	17.3	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		4.5			5.8			17.7			18.0	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	45.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			