



PROFESSION
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***Bentley Road Industrial Park
Traffic Impact Assessment***

***January 11, 2013
File: 1478***



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*BENTLEY RD INDUSTRIAL PARK
TRAFFIC IMPACT ASSESSMENT*

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1.0 INTRODUCTION

Boulevard Transportation Group, Ltd was retained by the District of Summerland to assess the traffic impacts of the proposed rezoning of the agricultural land reserve (ALR) in the Bentley Rd Industrial Area. The District plans to rezone 7.36 ha of the ALR (A1 zoning) to a proposed new M1-A business industrial zone.

1.1 Scope

This site is located on Bentley Rd west of Highway 97 and Bentley Rd Industrial Park. The study area incorporates the intersections of Highway 97 / Bentley Rd, Highway 97 / Sumac Ridge Dr, Highway 97 / Stuart St, and Highway 97/ Jones Flat Rd. The site location and study area are shown in Figure 1.

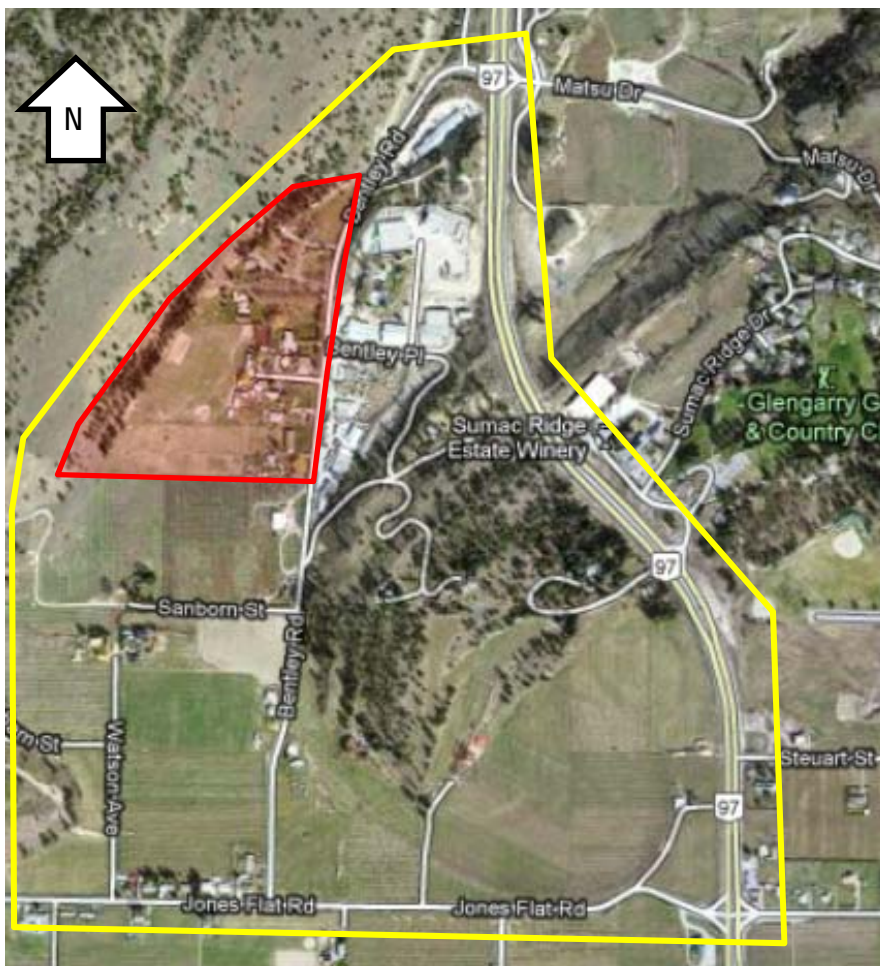


Figure 1: Site Location (Red) and Study Area (Yellow)

Note: Image source from Google Maps

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2.0 EXISTING CONDITIONS

2.1 Road Network

Bentley Rd is under the jurisdiction of the District of Summerland and is a local two-way undivided rural road with its north extent at Highway 97 and south extent at Jones Flat Rd. Bentley Rd has no shoulders or sidewalks and features a cattle guard to the north of the proposed rezoning development.

Jones Flat Rd is a collector two-way undivided road. It intersects with the south end of Bentley Rd and provides a second access from Highway 97 to the site.

Sumac Ridge Dr is a local two-way undivided roadway providing access to the Sumac Ridge Estate Winery, Glengarry Golf Club, and a small residential development on Sumac Ridge Dr. Steuart St is a local two-way undivided roadway that provides access to residential and the Jones Flat Rd industrial area.

Highway 97 is under the jurisdiction of the Ministry of Transportation and Infrastructure and provides the main north/south corridor through the Okanagan from Sicamous to Osoyoos. Highway 97 (in the project area) is classified as a four lane undivided rural arterial with paved shoulders and no sidewalk. Highway 97 has intersections in the study area with Bentley Rd / Matsu Dr, Sumac Ridge Dr, Steuart St, and Jones Flat Rd. The four intersections are two-way stop controlled with the free movement along Highway 97.

Speeds on Highway 97, in the project area, from north to south are:

- 100 km/h from the north extent to 300 m south of Bentley Rd / Matsu Dr; and
- 80 km/h from 300 m south of Bentley Rd / Matsu Dr to south extent.

2.2 Existing Land Use

The current site is an agricultural land reserve (ALR). There is an industrial park area to the east of the site on Bentley Rd and ALR surrounding.

2.3 Development of Base Model

Road geometric data were gathered from aerial photographs and a site visit to the study area. Traffic turning movement data were collected at the following location and times:

- Highway 97 / Bentley Rd and Jones Flat Rd
 - 8:00 AM to 9:00 AM on Tuesday, November 20, 2012

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- 4:00 PM to 5:00 PM on Tuesday, November 20, 2012
- Bentley Rd / Jones Flat Rd
 - 15-minute spot count at 9:00 AM on Tuesday November 20, 2012

The collected data were used to determine the existing traffic entering and exiting:

- Highway 97 / Bentley Rd
- Highway 97 / Jones Flat Rd

Turning movement volumes were estimated based on flow balancing and field observations at:

- Highway 97 / Sumac Ridge Dr
- Highway 97 / Steuart St
- Jones Flat Rd / Victoria Rd

The volumes were expanded using MoTI 2007 seasonal factor groups to the summer peak season. Turning movement volumes for existing conditions are shown in Figure 2.

The analysis is conducted using Synchro 6 software to evaluate four measures of effectiveness, Level of Service (LOS), queue lengths, delays, and volume / capacity ratio. For additional information on LOS and other measures of effectiveness see Appendix A.

2.4 Existing 2012 Traffic Conditions

During the AM peak, the westbound left turn on Bentley Rd, and the eastbound and westbound left turns on Jones Flat Rd operate at acceptable conditions. Details of the Synchro analysis can be found in Appendix B.

During the PM peak, movements on the Bentley Rd and Jones Flat Rd operate at acceptable conditions with left turns out of Jones Flat Rd operating at a unstable conditions. The volume of left turn traffic is relatively low and signals are not warranted under existing conditions; however, development of the ALR into an industrial park will increase traffic on these side streets.

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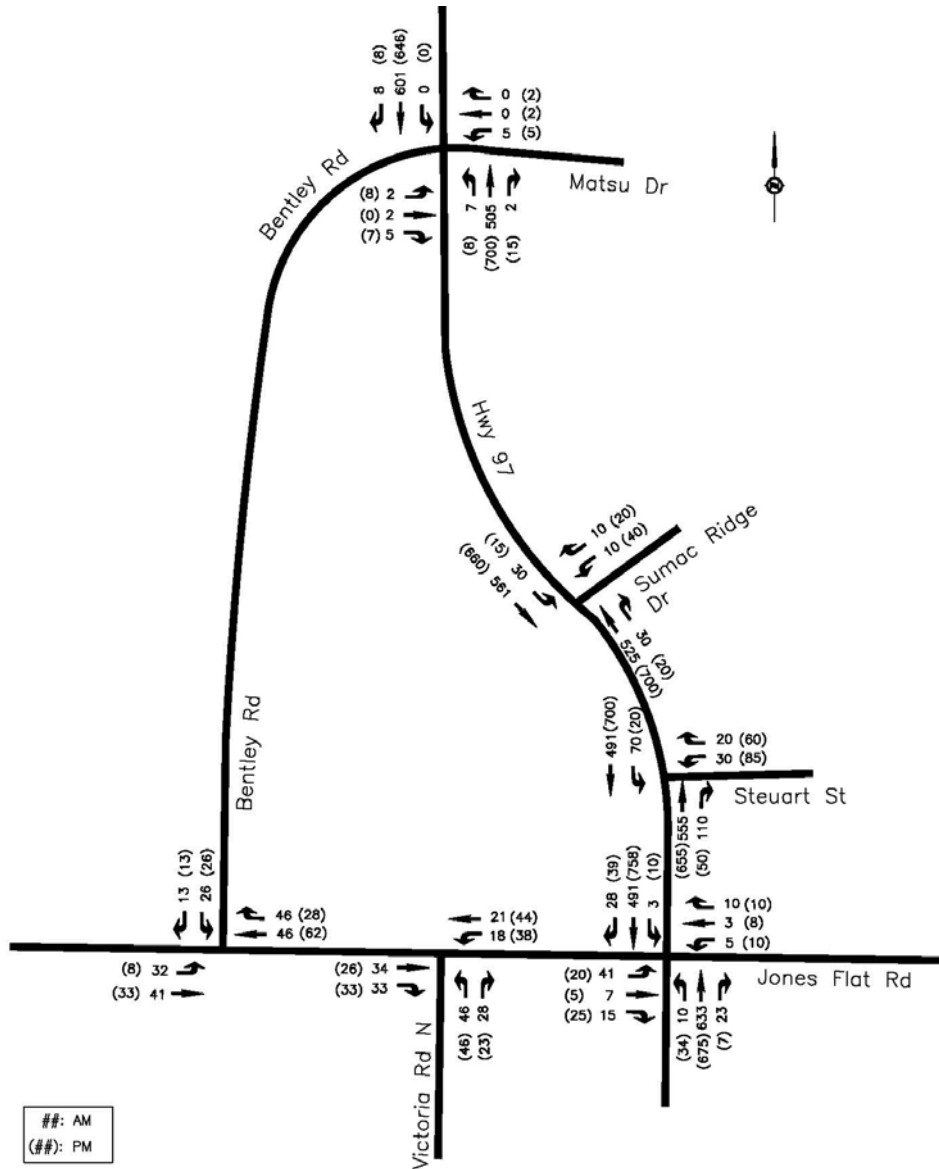


Figure 2: 2012 Existing Condition Turning Volumes

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3.0 POST DEVELOPMENT

3.1 Land Use

The properties will be rezoned from ALR (A1) to a business industrial park (M1-A). The M1-A proposes principal uses of an animal shelter; automotive and equipment repair shop, brewing and distilling; broadcasting studios business support service; private club; contractor services; eating and drinking establishment; equipment rental; farm equipment sales and rental; garden centre; indoor manufacturing operations; industrial high technology research and product design; primary and secondary processing of agricultural products; protective and emergency services; indoor recreational services; recycling depot; research centre and laboratory; warehouse sales establishment; and winery and cidery. The developments will be regulated for a maximum lot coverage of 60%.

3.2 Site Access

There are no proposed developments at this time for the rezoning. The proposed industrial park is opposite of the existing industrial park development along Bentley Rd. The proposed properties will be accessed from Bentley Rd via Jones Flat Rd and Highway 97.

3.3 Trip Generation

Trip generation rates are estimated using the ITE Trip Generation Manual 8th Edition. Trip generation rates were evaluated as follows:

- General Light Industrial and the Industrial Park were compared and have similar generation rates. General Light Industrial was selected as it is the higher of the two.
- Trip generation was also reviewed for the entire area to use the highest generator from the M1-A. This resulted in an enormous trip generation that are considered to be highly unlikely.

Therefore, General Light Industrial was utilized to generate the trips for the development area. The resulting trips are generated using 60% building lot coverage for General Light Industrial by gross floor area (GFA). The trip generation is shown in Table 1 for the AM and PM peak hour for adjacent street traffic. Trips to and from industrial developments are largely primary trips and therefore, pass-by, multi-purpose, and diverted link trips are not expected.

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Table 1: Trip Generation Rates for Proposed Land Use

AM Peak						
Code	Land Use	Unit	Rate	In/Out %	In	Out
110	Light Industrial	475.3 k-sqft	T=1.18(X)-89.28	88/12	415	57
PM Peak						
110	Light Industrial	475.3 k-sqft	T=1.43(X)-157.36	12/88	63	460

Note: Trips generated for square footage GFA use 60% maximum lot coverage
k-sqft refers to 1,000 square feet

3.4 Trip Distribution and Assignment

Based on the collected data during the site visit, more vehicles entered and exited the existing developed properties of the Bentley Rd Industrial Park from Highway 97 via Jones Flat Rd than via Bentley Rd. This was not expected since the current Industrial Park is closer to the Highway 97 / Bentley Rd intersection. Note that there is a cattle guard on Bentley Rd west of the Highway 97 intersection that truck drivers may not want to traverse. Development of the ALR into M1-A Business Industrial may no longer require the cattle guard. The trip assignment is shown in Figure 3 and Figure 4 for entering and exiting movements, respectively.

3.5 Post Development Conditions

Post development conditions are modeled for the AM and PM peak after full build-out of the Industrial Park. This section covers the AM and PM peak hour traffic for the intersections. Figure 5 shows the turning movements for the 2012 post development peak hour conditions. Results of the Synchro analysis are shown in Appendix C.

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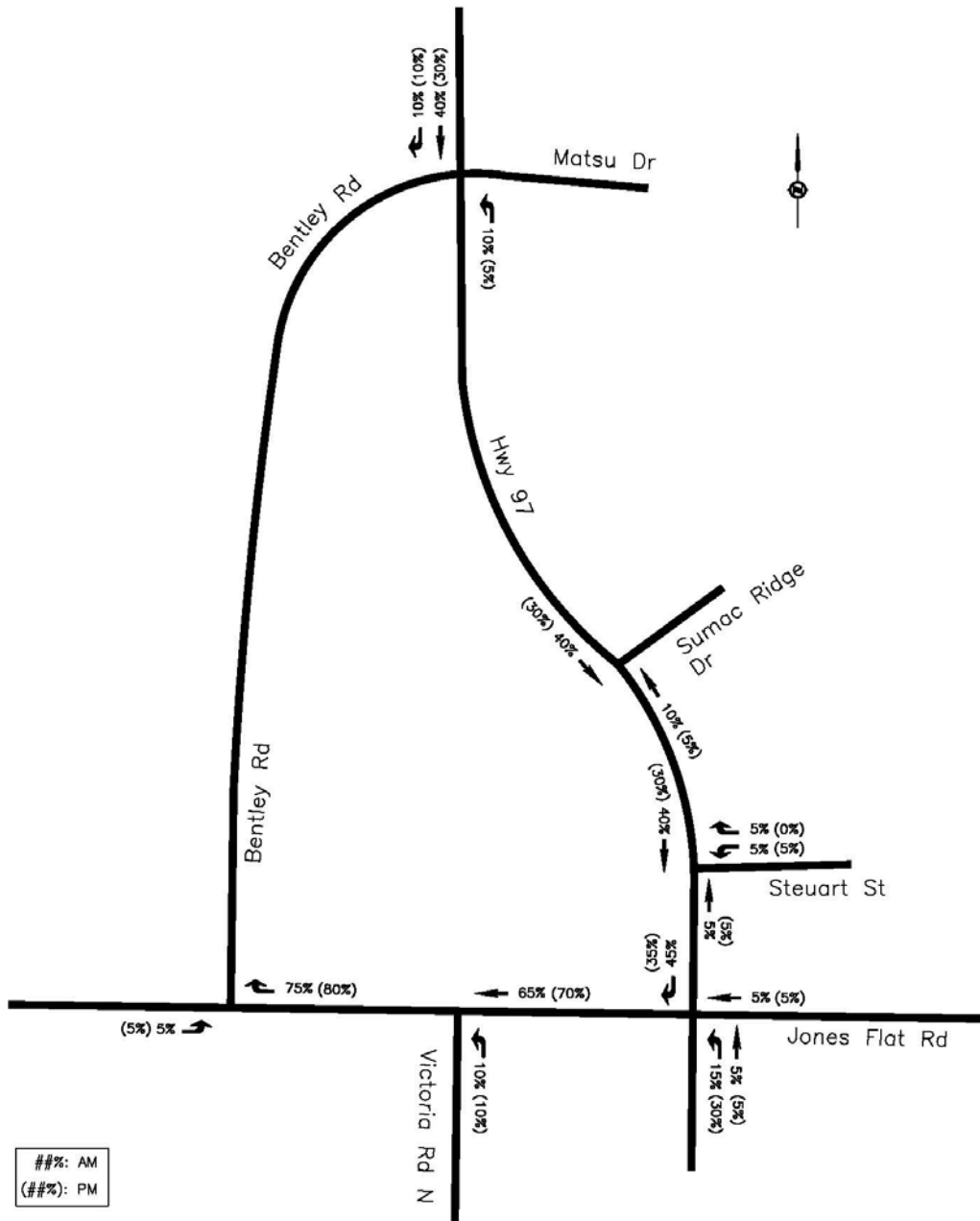


Figure 3: Trip Assignment for Entering Vehicles

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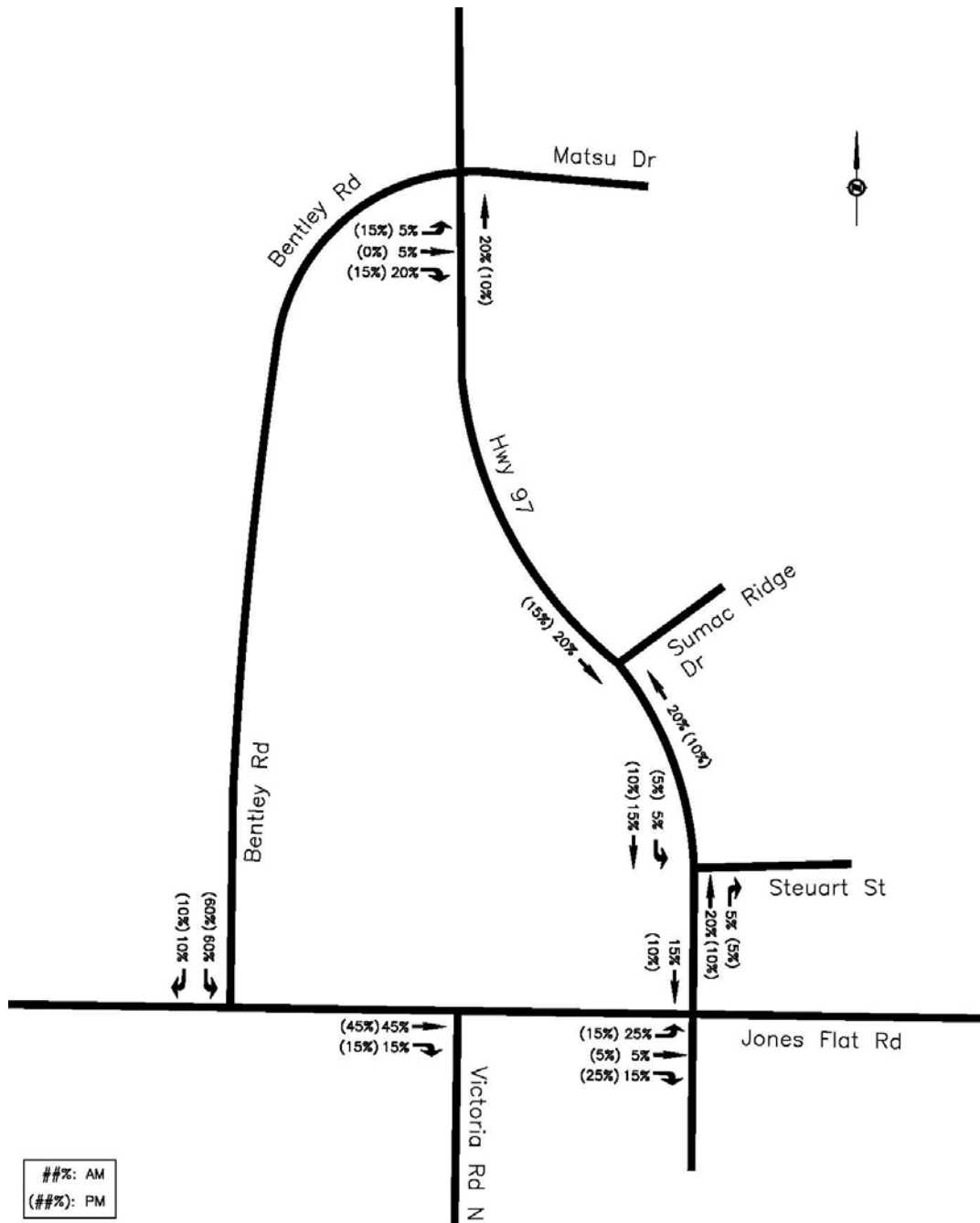


Figure 4: Trip Assignment of Exiting Vehicles

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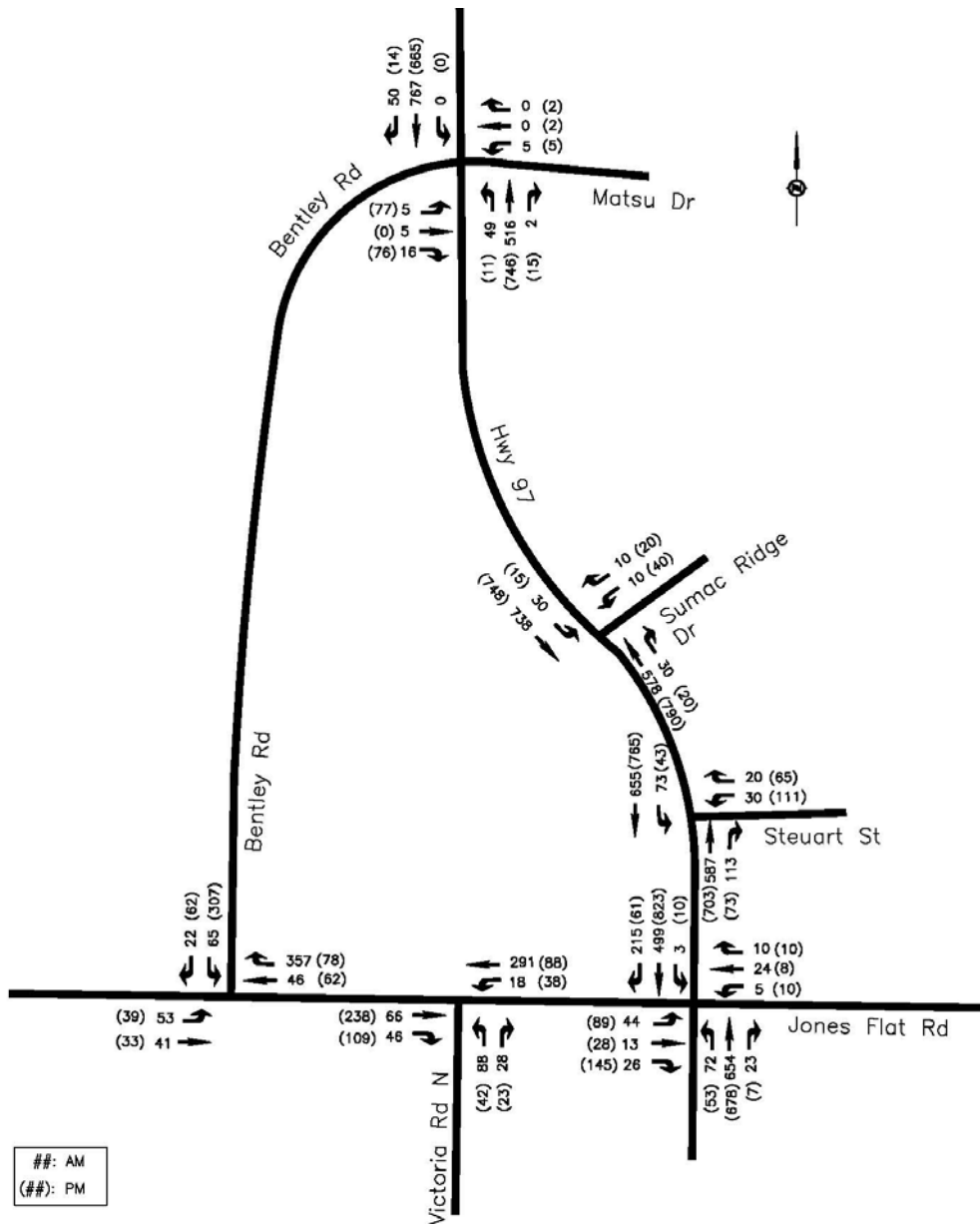


Figure 5: 2012 Post Development Turning Movements

At Bentley Rd, eastbound and westbound volumes will be failing in the AM, however, volumes are low. At Jones Flat Rd, the eastbound left turn, and westbound movements will be failing and mitigation is required.

During the PM peak, exiting volumes from Bentley Rd and Jones Flat Rd to Highway 97 are substantially higher and the movements are over capacity. MoTI signal warrants were reviewed for the

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intersections along Highway 97 to identify if signals would be warranted for any of the intersections. Jones Flat Rd was identified as a candidate for increased traffic control. Based on the MoTI signal warrants and the forecasted volumes, Jones Flat Rd meets four of the nine signal warrants for the 2012 post development (full build-out) scenario. A signal would not be needed at Bentley Rd since the site can be accessed via Jones Flat Rd and traffic will utilize the easier route to access Highway 97. In addition, Steuart St is accessible by Jones Flat Rd. Jones Flat operates at acceptable conditions with a signal and can support traffic diverted from westbound Bentley Rd at Highway 97 to Jones Flat Rd. Consideration may be given to restrict turning movements at Highway 97 / Bentley Rd during implementation of the signal.

Southbound movements at Bentley Rd / Jones Flat Rd become very large with the diverted volumes and operate under unstable/failing conditions. There are acceptable gaps in east/west traffic to clear queued traffic. A southbound left turn lane and/or increased traffic control (i.e. signalization or roundabout) may be considered as potential mitigation as warranted. It is recommended that operations are monitored at this intersection with the development of the Bentley Road Industrial Park once the signal at Highway 97 / Jones Flat Road is implemented.

4.0 FUTURE 10-YEAR HORIZON TRAFFIC CONDITIONS

The future 10-year horizon traffic conditions are assessed for the AM and PM peak periods for two scenarios. The first scenario assesses growth in the background traffic conditions without the development of the Bentley Rd Industrial Park Area (Section 4.1). The second scenario evaluates traffic conditions for post development (full build-out) of the Bentley Rd Industrial Area after 10-years (Section 4.2). The analysis of each scenario will determine if background traffic and/or traffic generated by the development will cause mitigation to be required.

4.1 2022 Background Peak Hour Traffic Conditions

The background peak hour traffic conditions factor the existing 2012 conditions by a growth rate of 2.0% per year. The growth rate is based on Highway 97 traffic growth and has been agreed upon by the Ministry. These values were entered into Synchro. While the turning movements at Bentley Rd and Jones Flat Rd to the highway are worse than existing conditions, a traffic signal is not warranted at either intersection based on background traffic growth. Appendix D contains the Synchro reports for the 2022 background conditions.

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4.2 2022 Post Development Peak Hour Traffic Conditions

The post development conditions are the sum the 2022 background traffic conditions plus the trips generated by the development after full build-out. The scenario is modeled with signalization implemented at Highway 97 / Jones Flat Rd. Trips have been diverted from Highway 97 / Bentley Rd to Highway 97 / Jones Flat Rd during the PM peak. The turning volumes are shown in Figure 6.

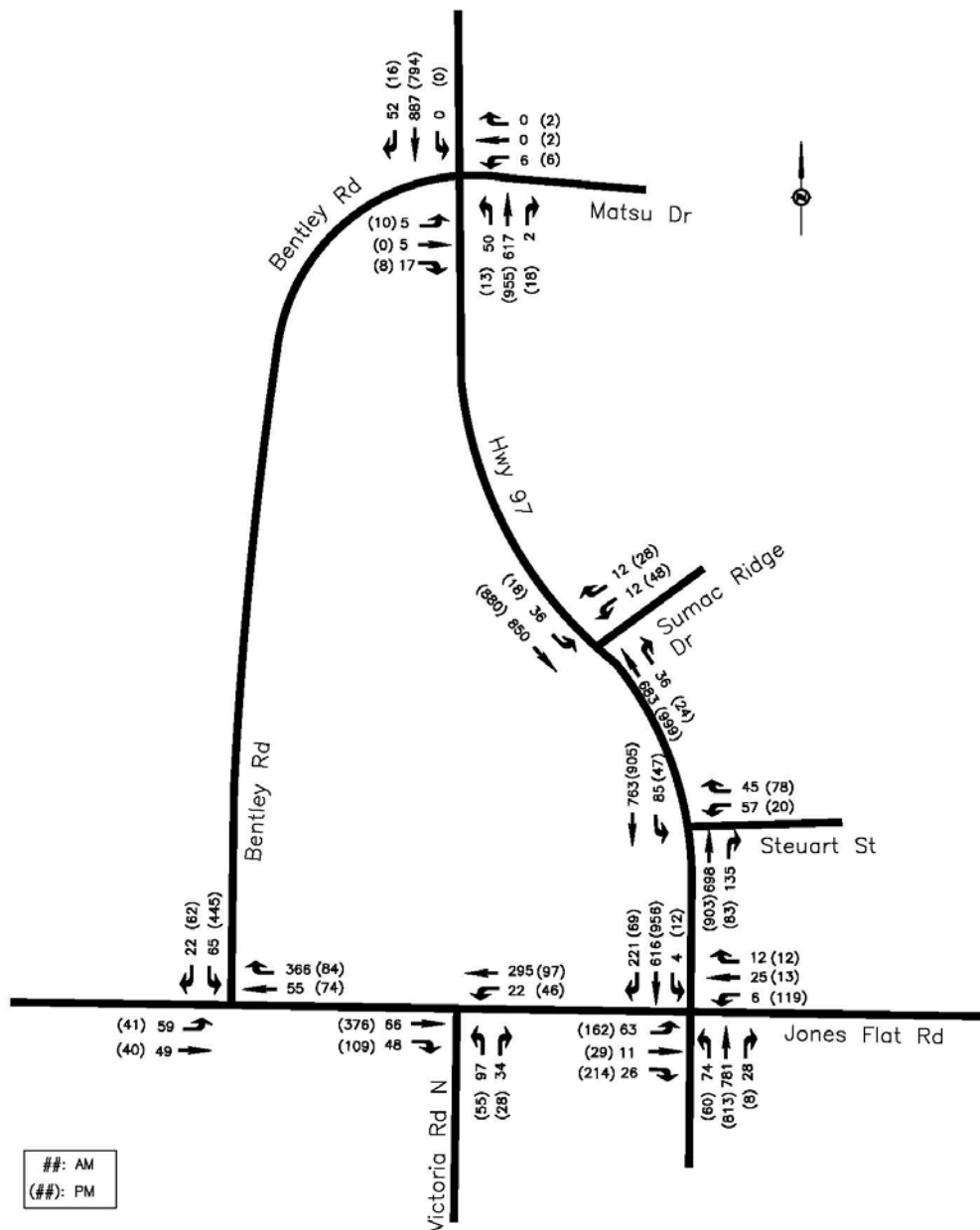


Figure 6: 2022 Post Development Turning Movements

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At Bentley Rd, eastbound and westbound volumes are failing in the AM, however, volumes are low and do not warrant a change in traffic control.

The traffic signal at Highway 97 / Jones Flat Rd will maintain acceptable operations with the diverted traffic. See Appendix E for details. There are unstable / failing for westbound Sumac Ridge Dr during the PM peak hour however, the turning volumes are low and to not warrant an upgrade in traffic control.

5.0 DESIGN

The development of the Bentley Rd Industrial Area provides an opportunity to upgrade roads in the project area to match cross-sections identified in the District of Summerland Transportation Master Plan. It is recommended that the roadway be upgraded to District standards.

Criteria for left turn bays and TAC lighting warrants are reviewed for Highway 97.

5.1 Left Turn Bays

Left turn bays on Highway 97 at Bentley Rd, Sumac Ridge Dr, Steuart St, and Jones Flat Rd have sufficient length to support 95th percentile queues during peak periods.

5.2 Lighting Warrants

Lighting conditions for all Highway 97 intersections in the study area were reviewed to ensure they meet TAC lighting warrants. Bentley Rd / Highway 97 meet the warrant for partial lighting. Illumination at Sumac Ridge Dr / Highway 97 meets the warrant for partial lighting. Steuart St is illuminated for partial lighting, but is warranted for delineation lighting. This is an existing condition that should be addressed by the Ministry. The intersection of Jones Flat Rd / Highway 97 appropriately meets the warrant for partial illumination.

6.0 SAFETY ANALYSIS

A safety analysis was conducted to assess collision history within the study area. Collision data were obtained from the Ministry to analyze existing collision statistics and ensure that new development does not exacerbate any existing safety conditions. Collision data were reviewed for 10 years from 2002 to 2011 on Highway 97 from Bentley Rd to Jones Flat Rd. This data is shown for each intersection in the study area in Table 2 below. There were no fatalities at the study intersections or

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along the corridor from 2002 to 2011. A combined total of 15 collisions occurred at the study intersections over the 10 year time period, 33% of which were injury collisions.

Collision rates were estimated based on through traffic volumes on Highway 97 north of Bentley Rd. The data were obtained from the Ministry's Traffic Data Program. On August 23, 2007 there were 10,715 vehicles recorded. Based on this, it is estimated that an average of 11,000 vehicles entered the study intersections each day from 2002 to 2011. The collision rate is determined per million entering vehicles. The highest collision rate is at Highway 97 / Sumac Ridge Dr for 0.15 collisions per million entering vehicles. The average provincial collision rate from 2006 to 2010 for a rural arterial 4-lane undivided roadway at an unsignalized intersection is 0.18 collisions per million entering vehicles. Therefore the collision rates at the intersections are not considered to be high.

Table 2: Intersection Collisions from 2002 to 2011

Intersection	Collision Severity			Total	Years	Collisions per Year	Collision Rate (C/MEV)
	PDO	Injury	Fatality				
Hwy 97 / Bentley Rd	3	1	0	4	10	0.4	0.10
Hwy 97 / Sumac Ridge Dr	3	3	0	6	10	0.6	0.15
Hwy 97 / Steuart St	0	1	0	1	10	0.1	0.02
Hwy 97 / Jones Flat Rd	4	0	0	4	10	0.4	0.10
Total	10	5	0	15			

Note: PDO – Property Damage Only
C/MEV – Collisions per Million Entering Vehicles

The three PDO collisions at Jones Flat Rd all incorporated a failure to yield. The provision of a signalized intersection with the development will provide improved intersection control for right of way. Injury collisions at Highway 97 / Sumac Ridge Dr involved two cases of running off road (alcohol suspected) and a 90-degree collision for a southbound vehicle turning left with a northbound through vehicle.

An increase in vehicles from Bentley Rd and Jones Flat Rd accessing Highway 97 can increase instances of collisions with a failure to yield. However, the provision of a signalized intersection at Jones Flat Rd can provide greater control to right of way and allow vehicles on the surrounding network to re-route. It should be noted that the provision of signals can increase other types of collisions such as rear end collisions.

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7.0 OTHER USERS

7.1 Pedestrian Facilities

There are currently sidewalks located on Bentley Rd from Sawyer Rd to Sanborn St along the northbound lane. There are no sidewalks located on Jones Flat Rd. As the site is developed, pedestrian facilities should be accommodated with road and frontage improvements. The District of Summerland Transportation Master Plan outlines cross-sections for collector and local roads that include sidewalks. It is recommended that the District of Summerland have road Development Cost Charges (DCCs) in place to help finance improvements to municipal roads through private development. This would aid in developing sidewalks, which will also require storm sewers, and curb and gutter.

If transit service is later provided, the provision of sidewalks will facilitate pedestrian connectivity between properties and bus landings.

7.2 Bicycle Facilities

There are currently no bicycle facilities along Bentley Rd or Jones Flat Rd. On-street recreational bicycle facilities are recommended in the Transportation Master Plan for Jones Flat Rd from Highway 97 to Garnet Valley Rd. The on-street recreational bicycle facilities are meant to support primary routes by providing connectivity to those routes. The recreational routes will utilize existing travel lanes or paved shoulders.

7.3 Transit

There are no public transit facilities in the project area and no routes were recommended in the Transportation Master Plan for the study area. However, development of transit routes in Summerland and the development of the Bentley Rd Industrial Park may change these requirements over time. If the Bentley Rd Industrial Park has sufficient density, local or regional transit service may be adopted.

8.0 CONCLUSIONS

The following conclusions are made regarding the traffic impact assessment for the proposed land use change of 7.36 ha of ALR to M1-A business industrial. The existing traffic conditions at the intersections of Highway 97 / Bentley Rd and Highway 97 / Jones Flat Rd do not warrant an upgrade in traffic control. The growth in background traffic conditions over 10 years at 2.0 % growth (without further development of the Bentley Rd Industrial Park) also do not warrant an upgrade in traffic control at these locations. However, the full build-out of the proposed rezoned properties will require increased

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traffic control at Highway 97 / Jones Flat Rd. Signalization of this intersection will divert traffic from the adjacent network to access Highway 97. The southbound left movements on Bentley Rd at Jones Flat Rd may require a left turn lane or increased control (signalization or roundabout) in the future. It is recommended that this location be monitored once signals are installed at Highway 97 / Jones Flat Rd. The timing for roadway improvements can be managed through independent traffic impact assessments for each development. It is recommended that the District require developers to conduct a traffic impact assessment prior to approval of the development. This will allow for staged planning of when road upgrades will be required. In addition, it is suggested that the District consider implementing road DCCs as an alternative to developers upgrading the road frontage. DCCs share the costs between developers for additional road network upgrades (outside of the property frontage) that would be impacted by the traffic generated from the proposed developments.

The intersection of Highway 97 / Stuart St is not correctly illuminated according to the TAC Lighting Warrant. It is lighted for partial lighting, but is warranted for delineated lighting. This is an existing condition that should be addressed by the Ministry.

A safety analysis of collision data does not indicate adverse effects to safety as a result of the development. Signalization of the Highway 97 / Jones Flat Rd intersection can reduce instances of vehicles failing to yield to the right of way. However, the provision of signals can increase other types of collisions such as rear end collisions.

Pedestrian facilities do not exist in the project area; however, development of the properties provides an opportunity to provide sidewalks as per cross-section designs in the District of Summerland Transportation Master Plan. The connectivity of pedestrian facilities is important if future transit service is added to the area to link bus stop landings to adjacent land use. Cycling facilities planned for Jones Flat Rd do not require additional infrastructure provisions.

9.0 RECOMMENDATIONS

The following recommendations are made for the development of ALR to M1-A zoning:

- The District may consider developing road DCCs as an alternative to requiring developers to upgrade the property frontage.
- The District should consider requiring individual traffic impact assessments to be submitted by developers prior to approval of individual developments. To identify when road network improvements will need to be implemented as a result of the individual developments.

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- The intersection of Highway 97 / Jones Flat Rd will require signalization. The timing for the signal installations can be managed through individual traffic impact assessments. The District and the Ministry should work together as the area develops to determine a suitable installation time.
- Monitor the intersection of Bentley Rd / Jones Flat Rd once Highway 97 / Jones Flat Rd is signalized to gauge the need for further upgrades or traffic control as warranted.
- Upgrade roadways in the project area (Bentley Rd and Jones Flat Rd) to District standard.
- Provide sidewalks with the development of the properties.

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APPENDIX A
Synchro Background

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SYNCHRO MODELLING SOFTWARE DESCRIPTION

The traffic analysis was completed using Synchro and SimTraffic traffic modelling software. Results were measured in delay, level of service (LOS), 95th percentile queue length and volume to capacity ratio. Synchro is based on the Highway Capacity Manual (HCM) methodology. SimTraffic integrates established driver behaviours and characteristics to simulate actual conditions by randomly “seeding” or positioning vehicles travelling throughout the network. The simulation is run five times (five different random seedings of vehicle types, behaviours and arrivals) to obtain statistical significance of the results.

Levels of Service

Traffic operations are typically described in terms of levels of service, which rates the amount of delay per vehicle for each movement and the entire intersection. Levels of service range from LOS A (representing best operations) to LOS E/F (LOS E being poor operations and LOS F being unpredictable/disruptive operations). LOS E/F are generally unacceptable levels of service under normal everyday conditions. A LOS C or better is considered acceptable operations, while D is considered to be on the threshold between acceptable and unacceptable operations.

The hierarchy of criteria for grading an intersection or movement not only includes delay times, but also takes into account traffic control type (stop signs or traffic signal). For example, if a vehicle is delayed for 19 seconds at an unsignalized intersection, it is considered to have an average operation, and would therefore be graded as an LOS C. However, at a signalized intersection, a 19 second delay would be considered a good operation and therefore it would be given an LOS B. The table below indicates the range of delay for LOS for signalized and unsignalized intersections.

Table A1: LOS Criteria, by Intersection Traffic Control

Level of Service	Unsignalized Intersection			Signalized Intersection		
	Average	Vehicle	Delay	Average	Vehicle	Delay
	(sec/veh)			(sec/veh)		
A	Less than 10			Less than 10		
B	10 to 15			11 to 20		
C	16 to 25			21 to 35		
D	26 to 35			36 to 55		
E	36 to 50			56 to 80		
F	More than 51			More than 81		

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APPENDIX B
2012 Existing Conditions
Synchro Results

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Table 3 and Table 4 show the total delay, LOS, 95th percentile queue, and volume-to-capacity ratio for the intersections of Highway 97 / Bentley Rd and Highway 97 / Jones Flat Rd, respectively. The remaining study intersections can be found in Appendix A. During the AM peak the westbound left turn on Bentley Rd, and the eastbound and westbound left turns on Jones Flat Rd operate at LOS D.

Table 3: Existing 2012 AM Peak Hour Traffic Conditions at Highway 97 / Bentley Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	9.6	0	0	-	0	0	20.8	20.8	20.8	25.2	-	-
LOS	A	A	A	-	A	A	C	C	C	D	-	-
Queue	0.4	0	0	-	0	0	2.0	2.0	2.0	1.7	-	-
V/C	0.02	0.16	0	-	0.19	0.01	0.08	0.08	0.08	0.07	-	-

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

Table 4: Existing 2012 AM Peak Hour Traffic Conditions at Highway 97 / Jones Flat Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	8.6	0	0	9.2	0	0	32.2	13.4	13.4	31.7	15.8	15.8
LOS	A	A	A	A	A	A	D	B	B	D	C	C
Queue	0.2	0	0	0.9	0	0	7.5	1.6	1.6	1.1	1.0	1.0
V/C	0.04	0.22	0.02	0.01	0.16	0.03	0.26	0.06	0.06	0.05	0.04	0.04

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

Table 5 and Table 6 show the total delay, LOS, 95th percentile queue, and volume-to-capacity ratio for the intersections of Highway 97 / Bentley Rd and Highway 97 / Jones Flat Rd, respectively. Movements on the minor roads (Bentley Rd and Jones Flat Rd) operate at LOS C to E with left turns out of Jones Flat Rd operating at a LOS F. The volume of left turn traffic is relatively low and signals are not warranted under existing conditions; however, development of the ALR into an industrial park will increase traffic on these side streets.

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Table 5: Existing 2012 PM Peak Hour Traffic Conditions at Highway 97 / Bentley Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	9.3	0	0	-	0	0	30.2	-	30.2	35.9	35.9	35.9
LOS	A	A	A	-	A	A	D	-	D	E	E	E
Queue	0.9	0	0	-	0	0	5.6	-	5.6	6.4	6.4	6.4
V/C	0.04	0.23	0.02	-	0.22	0.01	0.20	-	0.20	0.23	0.23	0.23

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

























Table 6: Existing 2012 PM Peak Hour Traffic Conditions at Highway 97 / Jones Flat Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	9.8	0	0	9.3	0	0	75.4	23.3	23.3	54.4	27.9	27.9
LOS	A	A	A	A	A	A	F	C	C	F	D	D
Queue	1.8	0	0	0.5	0	0	10.1	4.4	4.4	4.0	6.8	6.8
V/C	0.07	0.22	0.01	0.02	0.24	0.03	0.35	0.16	0.16	0.16	0.24	0.24

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio























HCM Unsignalized Intersection Capacity Analysis
53: Jones Flats Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	20	5	25	10	8	10	34	675	7	10	758	39
Peak Hour Factor	0.75	0.38	0.63	0.75	0.42	0.25	0.58	0.90	0.33	0.50	0.92	0.67
Hourly flow rate (vph)	27	13	40	13	19	40	59	750	21	20	824	58
Pedestrians	1			1			6			1		
Lane Width (m)	3.7			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			1			0		
Right turn flare (veh)	5			5								
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1368	1733	419	1333	1733	377	825			751		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1368	1733	419	1333	1733	377	825			751		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	84	93	84	76	94	93			98		
cM capacity (veh/h)	76	80	585	86	80	625	814			867		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	27	53	13	59	59	375	375	21	20	412	412	58
Volume Left	27	0	13	0	59	0	0	0	20	0	0	0
Volume Right	0	40	0	40	0	0	0	21	0	0	0	58
cSH	76	323	86	249	814	1700	1700	1700	867	1700	1700	1700
Volume to Capacity	0.35	0.16	0.16	0.24	0.07	0.22	0.22	0.01	0.02	0.24	0.24	0.03
Queue Length 95th (m)	10.1	4.4	4.0	6.8	1.8	0.0	0.0	0.0	0.5	0.0	0.0	0.0
Control Delay (s)	75.4	23.3	54.4	27.9	9.8	0.0	0.0	0.0	9.3	0.0	0.0	0.0
Lane LOS	F	C	F	D	A				A			
Approach Delay (s)	40.8		32.8		0.7				0.2			
Approach LOS	E		D									
Intersection Summary												
Average Delay	3.4											
Intersection Capacity Utilization	44.3%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
55: Bently Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	8	0	7	5	2	2	8	700	15	0	646	8
Peak Hour Factor	0.31	0.25	0.50	0.25	0.25	0.25	0.25	0.89	0.56	0.25	0.86	0.63
Hourly flow rate (vph)	26	0	14	20	8	8	32	787	27	0	751	13
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			5			5						
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1212	1602	376	1226	1602	393	751			787		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1212	1602	376	1226	1602	393	751			787		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	80	100	98	85	92	99	96			100		
cM capacity (veh/h)	126	103	628	130	103	611	867			842		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4		
Volume Total	40	36	32	393	393	27	0	376	376	13		
Volume Left	26	20	32	0	0	0	0	0	0	0		
Volume Right	14	8	0	0	0	27	0	0	0	13		
cSH	195	157	867	1700	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.20	0.23	0.04	0.23	0.23	0.02	0.00	0.22	0.22	0.01		
Queue Length 95th (m)	5.6	6.4	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Control Delay (s)	30.2	35.9	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	D	E	A									
Approach Delay (s)	30.2	35.9	0.4									
Approach LOS	D	E										
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization			37.1%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	8	33	62	28	26	13
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	11	47	89	40	37	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	129				179	109
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129				179	109
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	98
cM capacity (veh/h)	1470				798	951

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	59	129	56
Volume Left	11	0	37
Volume Right	0	40	19
cSH	1470	1700	843
Volume to Capacity	0.01	0.08	0.07
Queue Length 95th (m)	0.2	0.0	1.6
Control Delay (s)	1.5	0.0	9.6
Lane LOS	A		A
Approach Delay (s)	1.5	0.0	9.6
Approach LOS			A

Intersection Summary			
Average Delay		2.6	
Intersection Capacity Utilization	19.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↷			↶	↷	↶
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	26	33	38	44	46	23
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	33	65	54	73	58	38
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			100		250	69
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			100		250	69
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		92	96
cM capacity (veh/h)			1503		709	992
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	98	128	95			
Volume Left	0	54	58			
Volume Right	65	0	38			
cSH	1700	1503	799			
Volume to Capacity	0.06	0.04	0.12			
Queue Length 95th (m)	0.0	0.9	3.1			
Control Delay (s)	0.0	3.3	10.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.3	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization		22.5%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
60: Steuart St & Highway 97

1/10/2013



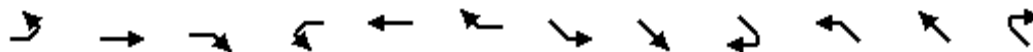
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↕↔		↔	↕↕
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	80	65	655	50	20	700
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	71	712	54	22	761
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1163	383			766	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1163	383			766	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	52	89			97	
cM capacity (veh/h)	183	615			843	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	158	475	292	22	380	380
Volume Left	87	0	0	22	0	0
Volume Right	71	0	54	0	0	0
cSH	267	1700	1700	843	1700	1700
Volume to Capacity	0.59	0.28	0.17	0.03	0.22	0.22
Queue Length 95th (m)	26.2	0.0	0.0	0.6	0.0	0.0
Control Delay (s)	36.2	0.0	0.0	9.4	0.0	0.0
Lane LOS	E			A		
Approach Delay (s)	36.2	0.0		0.3		
Approach LOS	E					

Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization		36.3%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↕	↕	↕↔			↕	↕↕
Sign Control		Stop			Stop			Free				Free
Grade		0%			0%			7%				7%
Volume (veh/h)	0	0	0	40	0	20	15	660	0	0	700	20
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	80	0	40	25	717	0	0	761	40
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)								5				
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1148	1528	359	1170	1528	380	761			717		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1148	1528	359	1170	1528	380	761			717		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	45	100	94	97			100		
cM capacity (veh/h)	141	113	638	145	113	617	847			879		

Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	120	25	478	239	0	380	380	40
Volume Left	0	80	25	0	0	0	0	0	0
Volume Right	0	40	0	0	0	0	0	0	40
cSH	1700	217	847	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.55	0.03	0.28	0.14	0.00	0.22	0.22	0.02
Queue Length 95th (m)	0.0	22.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	41.7	9.4	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	E	A						
Approach Delay (s)	0.0	41.7	0.3			0.0			
Approach LOS	A	E							

Intersection Summary		
Average Delay		3.1
Intersection Capacity Utilization	30.4%	ICU Level of Service
Analysis Period (min)		15
		A























HCM Unsignalized Intersection Capacity Analysis
 53: Jones Flats Rd & Highway 97

1/10/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↑↑	↗	↖	↑↑	↗
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	20	5	25	10	8	10	34	675	7	10	758	39
Peak Hour Factor	0.75	0.38	0.63	0.75	0.42	0.25	0.58	0.90	0.33	0.50	0.92	0.67
Hourly flow rate (vph)	27	13	40	13	19	40	59	750	21	20	824	58
Pedestrians	1			1			6			1		
Lane Width (m)	3.7			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			1			0		
Right turn flare (veh)	5			5								
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1368	1733	419	1333	1733	377	825			751		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1368	1733	419	1333	1733	377	825			751		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	84	93	84	76	94	93			98		
cM capacity (veh/h)	76	80	585	86	80	625	814			867		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	27	53	13	59	59	375	375	21	20	412	412	58
Volume Left	27	0	13	0	59	0	0	0	20	0	0	0
Volume Right	0	40	0	40	0	0	0	21	0	0	0	58
cSH	76	323	86	249	814	1700	1700	1700	867	1700	1700	1700
Volume to Capacity	0.35	0.16	0.16	0.24	0.07	0.22	0.22	0.01	0.02	0.24	0.24	0.03
Queue Length 95th (m)	10.1	4.4	4.0	6.8	1.8	0.0	0.0	0.0	0.5	0.0	0.0	0.0
Control Delay (s)	75.4	23.3	54.4	27.9	9.8	0.0	0.0	0.0	9.3	0.0	0.0	0.0
Lane LOS	F	C	F	D	A				A			
Approach Delay (s)	40.8		32.8		0.7				0.2			
Approach LOS	E		D									
Intersection Summary												
Average Delay	3.4											
Intersection Capacity Utilization	44.3%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
 55: Bently Rd & Highway 97

1/10/2013

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
Volume (veh/h)	8	0	7	5	2	2	8	700	15	0	646	8	
Peak Hour Factor	0.31	0.25	0.50	0.25	0.25	0.25	0.25	0.89	0.56	0.25	0.86	0.63	
Hourly flow rate (vph)	26	0	14	20	8	8	32	787	27	0	751	13	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)			5			5							
Median type	None			None									
Median storage (veh)													
Upstream signal (m)													
pX, platoon unblocked													
vC, conflicting volume	1212	1602	376	1226	1602	393	751			787			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1212	1602	376	1226	1602	393	751			787			
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1			
tC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2			
p0 queue free %	80	100	98	85	92	99	96			100			
cM capacity (veh/h)	126	103	628	130	103	611	867			842			
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4			
Volume Total	40	36	32	393	393	27	0	376	376	13			
Volume Left	26	20	32	0	0	0	0	0	0	0			
Volume Right	14	8	0	0	0	27	0	0	0	13			
cSH	195	157	867	1700	1700	1700	1700	1700	1700	1700			
Volume to Capacity	0.20	0.23	0.04	0.23	0.23	0.02	0.00	0.22	0.22	0.01			
Queue Length 95th (m)	5.6	6.4	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Control Delay (s)	30.2	35.9	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Lane LOS	D	E	A										
Approach Delay (s)	30.2	35.9	0.4					0.0					
Approach LOS	D	E											
Intersection Summary													
Average Delay			1.7										
Intersection Capacity Utilization			37.1%	ICU Level of Service		A							
Analysis Period (min)			15										

HCM Unsignalized Intersection Capacity Analysis
58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	8	33	62	28	26	13
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	11	47	89	40	37	19
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	129				179	109
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	129				179	109
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				95	98
cM capacity (veh/h)	1470				798	951
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	59	129	56			
Volume Left	11	0	37			
Volume Right	0	40	19			
cSH	1470	1700	843			
Volume to Capacity	0.01	0.08	0.07			
Queue Length 95th (m)	0.2	0.0	1.6			
Control Delay (s)	1.5	0.0	9.6			
Lane LOS	A		A			
Approach Delay (s)	1.5	0.0	9.6			
Approach LOS			A			
Intersection Summary						
Average Delay			2.6			
Intersection Capacity Utilization		19.0%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↷			↶	↶	↷
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	26	33	38	44	46	23
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	33	65	54	73	58	38
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			100		250	69
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			100		250	69
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		92	96
cM capacity (veh/h)			1503		709	992
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	98	128	95			
Volume Left	0	54	58			
Volume Right	65	0	38			
cSH	1700	1503	799			
Volume to Capacity	0.06	0.04	0.12			
Queue Length 95th (m)	0.0	0.9	3.1			
Control Delay (s)	0.0	3.3	10.1			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.3	10.1			
Approach LOS			B			
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization		22.5%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
60: Steuart St & Highway 97

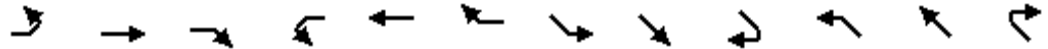
1/10/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙		↕	↘	↙	↕
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	80	65	655	50	20	700
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	87	71	712	54	22	761
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1163	383			766	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1163	383			766	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	52	89			97	
cM capacity (veh/h)	183	615			843	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	158	475	292	22	380	380
Volume Left	87	0	0	22	0	0
Volume Right	71	0	54	0	0	0
cSH	267	1700	1700	843	1700	1700
Volume to Capacity	0.59	0.28	0.17	0.03	0.22	0.22
Queue Length 95th (m)	26.2	0.0	0.0	0.6	0.0	0.0
Control Delay (s)	36.2	0.0	0.0	9.4	0.0	0.0
Lane LOS	E			A		
Approach Delay (s)	36.2	0.0		0.3		
Approach LOS	E					
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			36.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↗	↗	↗	↕		↗	↗
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			7%			7%	
Volume (veh/h)	0	0	0	40	0	20	15	660	0	0	700	20
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	80	0	40	25	717	0	0	761	40
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)							5					
Median type		None		None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1148	1528	359	1170	1528	380	761			717		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1148	1528	359	1170	1528	380	761			717		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	45	100	94	97			100		
cM capacity (veh/h)	141	113	638	145	113	617	847			879		

Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	120	25	478	239	0	380	380	40
Volume Left	0	80	25	0	0	0	0	0	0
Volume Right	0	40	0	0	0	0	0	0	40
cSH	1700	217	847	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.55	0.03	0.28	0.14	0.00	0.22	0.22	0.02
Queue Length 95th (m)	0.0	22.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	41.7	9.4	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	E	A						
Approach Delay (s)	0.0	41.7	0.3			0.0			
Approach LOS	A	E							

Intersection Summary			
Average Delay		3.1	
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)		15	

*BENTLEY RD INDUSTRIAL PARK
TRAFFIC IMPACT ASSESSMENT*

APPENDIX C
2012 Post Development
Synchro Results

BENTLEY RD INDUSTRIAL PARK
TRAFFIC IMPACT ASSESSMENT

Table 7 and Table 8 show the conditions at Highway 97 / Bentley Rd and Highway 97 / Jones Flat Rd. At Bentley Rd, eastbound and westbound volumes will be failing in the AM, however, volumes are low. At Jones Flat Rd, the eastbound left, and westbound movements will be failing and mitigation is required.

Table 7: Post Development 2012 AM Peak Hour Traffic Conditions at Highway 97 / Bentley Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	11.4	0	0	-	0	0	45.8	45.8	45.8	50.9	-	-
LOS	B	A	A	-	A	A	E	E	E	F	-	-
Queue	3.9	0	0	-	0	0	13.4	13.4	13.4	3.7	-	-
V/C	0.15	0.16	0	-	0.25	0.05	0.40	0.40	0.40	0.14	-	-

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

Table 8: Post Development 2012 AM Peak Hour Traffic Conditions at Highway 97 / Jones Flat Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	9.8	0	0	9.3	0	0	Err	24.6	24.6	126	180	180
LOS	A	A	A	A	A	A	F	C	C	F	F	F
Queue	8.7	0	0	0.2	0	0	Err	8.8	8.8	4.4	37.4	37.4
V/C	0.28	0.23	0.02	0.01	0.16	0.21	7.02	0.29	0.29	0.18	0.97	0.97

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

During the PM peak, exiting volumes from Bentley Rd and Jones Flat Rd to Highway 97 are substantially higher, resulting in LOS F. These movements are over capacity with volume to capacity ratios greater than 1.0. MoTI signal warrants were reviewed for the intersections along Highway 97 to identify if signals would be warranted for any of the intersections. Jones Flat Rd was identified as a candidate for increased traffic control. Based on the MoTI signal warrants and the forecasted volumes, Jones Flat Rd meets four of the nine signal warrants for the 2012 post development (full build-out) scenario. A signal would not be needed at Bentley Rd since the site can be accessed via Jones Flat Rd and traffic will utilize the easier route to access Highway 97. In addition, Stuart St is accessible by Jones Flat Rd and would also not require a signal. Jones Flat operates at a LOS B with a signal and traffic diverted from westbound Bentley Rd at Highway 97 to Jones Flat Rd.

BENTLEY RD INDUSTRIAL PARK
TRAFFIC IMPACT ASSESSMENT

Southbound movements at Bentley Rd / Jones Flat Rd become very large with the diverted volumes and operate at LOS F. The model adds a left turn lane to the southbound movement. If the westbound movements divert from Highway 97 / Bentley Rd to the signalized intersection at Jones Flat Rd / Bentley Rd then additional control will be needed to handle the southbound left turn movements. A roundabout or signal would operate at LOS B or higher.

Table 9: Post Development 2012 PM Peak Hour Traffic Conditions at Highway 97 / Bentley Rd (No Signal at Jones Flat Rd)

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	9.5	0	0	-	0	0	732	-	732	53.5	53.5	53.5
LOS	A	A	A	-	A	A	F	-	F	F	F	F
Queue	1.2	0	0	-	0	0	261	-	261	9.6	9.6	9.6
V/C	0.05	0.25	0.02	-	0.23	0.01	2.49	-	2.49	0.32	0.32	0.32

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

























Table 10: Post Development 2012 PM Peak Hour Traffic Conditions at Highway 97 / Jones Flat Rd (Unsignalized)

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	10.3	0	0	9.3	0	0	703	193	193	Err	35.3	35.3
LOS	B	A	A	A	A	A	F	F	F	F	E	E
Queue	8.7	0	0	0.2	0	0	Err	8.8	8.8	Err	37.4	37.4
V/C	0.12	0.22	0.01	0.02	0.26	0.05	2.18	1.27	1.27	Err	0.97	0.97

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

HCM Unsignalized Intersection Capacity Analysis
 53: Jones Flats Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	44	13	26	5	24	10	72	654	23	3	499	215
Peak Hour Factor	0.89	0.92	0.32	0.75	0.50	0.50	0.25	0.85	0.70	0.50	0.91	0.61
Hourly flow rate (vph)	49	14	81	7	48	20	288	769	33	6	548	352
Pedestrians	1			1			6			1		
Lane Width (m)	3.7			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			1			0		
Right turn flare (veh)	5			5								
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1547	1908	281	1646	1908	387	549			770		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1547	1908	281	1646	1908	387	549			770		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	71	89	82	3	97	72			99		
cM capacity (veh/h)	7	49	718	36	49	616	1030			852		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	49	95	7	68	288	385	385	33	6	274	274	352
Volume Left	49	0	7	0	288	0	0	0	6	0	0	0
Volume Right	0	81	0	20	0	0	0	33	0	0	0	352
cSH	7	334	36	70	1030	1700	1700	1700	852	1700	1700	1700
Volume to Capacity	7.02	0.29	0.18	0.97	0.28	0.23	0.23	0.02	0.01	0.16	0.16	0.21
Queue Length 95th (m)	Err	8.8	4.4	37.4	8.7	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Control Delay (s)	Err	24.6	125.6	179.7	9.8	0.0	0.0	0.0	9.3	0.0	0.0	0.0
Lane LOS	F	C	F	F	A				A			
Approach Delay (s)	3429.7		174.9		2.6				0.1			
Approach LOS	F		F									
Intersection Summary												
Average Delay			231.3									
Intersection Capacity Utilization			42.4%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

55: Bently Rd & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	5	16	5	0	0	49	516	2	0	767	50
Peak Hour Factor	0.25	0.25	0.75	0.38	0.25	0.25	0.50	0.92	0.25	0.25	0.92	0.63
Hourly flow rate (vph)	20	20	21	13	0	0	98	561	8	0	834	79
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			5			5						
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1310	1591	417	1184	1591	280	834			561		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1310	1591	417	1184	1591	280	834			561		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	81	78	96	87	100	100	85			100		
cM capacity (veh/h)	105	93	590	105	93	723	664			1020		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4		
Volume Total	61	13	98	280	280	8	0	417	417	79		
Volume Left	20	13	98	0	0	0	0	0	0	0		
Volume Right	21	0	0	0	0	8	0	0	0	79		
cSH	152	91	664	1700	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.40	0.14	0.15	0.16	0.16	0.00	0.00	0.25	0.25	0.05		
Queue Length 95th (m)	13.4	3.7	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Control Delay (s)	45.8	50.9	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	E	F	B									
Approach Delay (s)	45.8	50.9	1.7				0.0					
Approach LOS	E	F										
Intersection Summary												
Average Delay			2.8									
Intersection Capacity Utilization			40.7%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	53	41	46	357	65	22
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	76	59	66	510	93	31
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	576				531	321
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	576				531	321
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				80	96
cM capacity (veh/h)	1008				466	725

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	134	576	124
Volume Left	76	0	93
Volume Right	0	510	31
cSH	1008	1700	512
Volume to Capacity	0.08	0.34	0.24
Queue Length 95th (m)	1.8	0.0	7.2
Control Delay (s)	5.3	0.0	14.3
Lane LOS	A		B
Approach Delay (s)	5.3	0.0	14.3
Approach LOS			B

Intersection Summary			
Average Delay		3.0	
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	66	46	18	291	88	28
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	85	90	26	485	110	46
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			177		668	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			177		668	133
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		73	95
cM capacity (veh/h)			1409		413	914

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	175	511	156
Volume Left	0	26	110
Volume Right	90	0	46
cSH	1700	1409	493
Volume to Capacity	0.10	0.02	0.32
Queue Length 95th (m)	0.0	0.4	10.2
Control Delay (s)	0.0	0.6	15.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.6	15.6
Approach LOS			C

Intersection Summary			
Average Delay		3.2	
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 60: Stuart St & Highway 97

1/10/2013



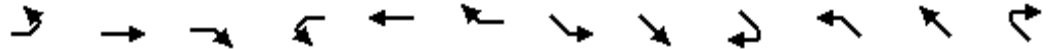
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	30	20	587	113	73	655
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	22	638	123	79	712
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1214	380			761	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1214	380			761	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	96			91	
cM capacity (veh/h)	158	617			847	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	54	425	336	79	356	356
Volume Left	33	0	0	79	0	0
Volume Right	22	0	123	0	0	0
cSH	225	1700	1700	847	1700	1700
Volume to Capacity	0.24	0.25	0.20	0.09	0.21	0.21
Queue Length 95th (m)	7.0	0.0	0.0	2.3	0.0	0.0
Control Delay (s)	26.1	0.0	0.0	9.7	0.0	0.0
Lane LOS	D			A		
Approach Delay (s)	26.1	0.0		1.0		
Approach LOS	D					

Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization		38.5%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



























Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↕	↕	↕↕		↕	↕↕	↕
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			7%			7%	
Volume (veh/h)	0	0	0	10	0	10	30	738	0	0	578	30
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	20	0	20	50	802	0	0	628	60
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)							5					
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1216	1530	401	1129	1530	314	628			802		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1216	1530	401	1129	1530	314	628			802		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	87	100	97	95			100		
cM capacity (veh/h)	128	110	599	152	110	682	950			817		

Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	40	50	535	267	0	314	314	60
Volume Left	0	20	50	0	0	0	0	0	0
Volume Right	0	20	0	0	0	0	0	0	60
cSH	1700	305	950	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.13	0.05	0.31	0.16	0.00	0.18	0.18	0.04
Queue Length 95th (m)	0.0	3.4	1.3	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	21.3	9.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	C	A						
Approach Delay (s)	0.0	21.3	0.5			0.0			
Approach LOS	A	C							

Intersection Summary		
Average Delay		0.8
Intersection Capacity Utilization	36.3%	ICU Level of Service
Analysis Period (min)		15
		A























HCM Unsignalized Intersection Capacity Analysis
 53: Jones Flats Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	89	28	145	10	8	10	53	678	7	10	823	61
Peak Hour Factor	0.75	0.38	0.63	0.75	0.42	0.25	0.58	0.90	0.33	0.50	0.92	0.67
Hourly flow rate (vph)	119	74	230	13	19	40	91	753	21	20	895	91
Pedestrians	1			1			6			1		
Lane Width (m)	3.7			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			1			0		
Right turn flare (veh)	5			5								
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1506	1873	454	1467	1873	379	896			754		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1506	1873	454	1467	1873	379	896			754		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	59	0	70	94	88			98		
cM capacity (veh/h)	55	62	555	0	62	624	766			864		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	119	304	13	59	91	377	377	21	20	447	447	91
Volume Left	119	0	13	0	91	0	0	0	20	0	0	0
Volume Right	0	230	0	40	0	0	0	21	0	0	0	91
cSH	55	239	0	194	766	1700	1700	1700	864	1700	1700	1700
Volume to Capacity	2.18	1.27	Err	0.30	0.12	0.22	0.22	0.01	0.02	0.26	0.26	0.05
Queue Length 95th (m)	89.6	117.9	Err	9.3	3.1	0.0	0.0	0.0	0.5	0.0	0.0	0.0
Control Delay (s)	703.2	193.3	Err	35.3	10.3	0.0	0.0	0.0	9.3	0.0	0.0	0.0
Lane LOS	F	F	F	E	B				A			
Approach Delay (s)	336.5		Err		1.1				0.2			
Approach LOS	F		F									
Intersection Summary												
Average Delay	Err											
Intersection Capacity Utilization	49.5%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
55: Bently Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	77	0	76	5	2	2	11	746	15	0	665	14
Peak Hour Factor	0.31	0.25	0.50	0.25	0.25	0.25	0.25	0.89	0.56	0.25	0.86	0.63
Hourly flow rate (vph)	248	0	152	20	8	8	44	838	27	0	773	22
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			5			5						
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1284	1699	387	1313	1699	419	773			838		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1284	1699	387	1313	1699	419	773			838		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	100	75	77	91	99	95			100		
cM capacity (veh/h)	109	88	618	86	88	588	851			805		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4		
Volume Total	400	36	44	419	419	27	0	387	387	22		
Volume Left	248	20	44	0	0	0	0	0	0	0		
Volume Right	152	8	0	0	0	27	0	0	0	22		
cSH	161	111	851	1700	1700	1700	1700	1700	1700	1700		
Volume to Capacity	2.49	0.32	0.05	0.25	0.25	0.02	0.00	0.23	0.23	0.01		
Queue Length 95th (m)	260.7	9.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Control Delay (s)	732.3	53.5	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	F	F	A									
Approach Delay (s)	732.3	53.5	0.5									
Approach LOS	F	F										
Intersection Summary												
Average Delay			138.0									
Intersection Capacity Utilization			39.6%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	39	33	62	78	307	62
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	56	47	89	111	439	89
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	200				303	144
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	200				303	144
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				33	90
cM capacity (veh/h)	1384				655	908

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	103	200	527
Volume Left	56	0	439
Volume Right	0	111	89
cSH	1384	1700	687
Volume to Capacity	0.04	0.12	0.77
Queue Length 95th (m)	1.0	0.0	55.1
Control Delay (s)	4.3	0.0	25.3
Lane LOS	A		D
Approach Delay (s)	4.3	0.0	25.3
Approach LOS			D

Intersection Summary			
Average Delay		16.6	
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	238	109	38	88	42	23
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	305	214	54	147	52	38
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			521		669	415
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			521		669	415
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		87	94
cM capacity (veh/h)			1054		399	636
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	519	201	90			
Volume Left	0	54	52			
Volume Right	214	0	38			
cSH	1700	1054	472			
Volume to Capacity	0.31	0.05	0.19			
Queue Length 95th (m)	0.0	1.2	5.3			
Control Delay (s)	0.0	2.7	14.4			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.7	14.4			
Approach LOS			B			
Intersection Summary						
Average Delay			2.3			
Intersection Capacity Utilization		41.7%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 60: Steuart St & Highway 97

1/10/2013



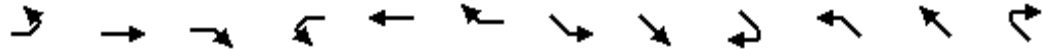
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↕↔		↔	↕↕
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Volume (veh/h)	111	65	703	73	43	765
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	121	71	764	79	47	832
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1313	422			843	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1313	422			843	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	14	88			94	
cM capacity (veh/h)	141	580			788	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	191	509	334	47	416	416
Volume Left	121	0	0	47	0	0
Volume Right	71	0	79	0	0	0
cSH	196	1700	1700	788	1700	1700
Volume to Capacity	0.98	0.30	0.20	0.06	0.24	0.24
Queue Length 95th (m)	62.3	0.0	0.0	1.4	0.0	0.0
Control Delay (s)	108.5	0.0	0.0	9.9	0.0	0.0
Lane LOS	F			A		
Approach Delay (s)	108.5	0.0		0.5		
Approach LOS	F					

Intersection Summary			
Average Delay		11.1	
Intersection Capacity Utilization	47.0%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↕	↕	↕↕		↕	↕↕	↕
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			7%			7%	
Volume (veh/h)	0	0	0	40	0	20	15	748	0	0	790	20
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	80	0	40	25	813	0	0	859	40
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)							5					
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1292	1722	407	1315	1722	429	859			813		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1292	1722	407	1315	1722	429	859			813		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	29	100	93	97			100		
cM capacity (veh/h)	109	86	594	113	86	574	778			810		

























Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	120	25	542	271	0	429	429	40
Volume Left	0	80	25	0	0	0	0	0	0
Volume Right	0	40	0	0	0	0	0	0	40
cSH	1700	169	778	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.71	0.03	0.32	0.16	0.00	0.25	0.25	0.02
Queue Length 95th (m)	0.0	32.7	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	65.1	9.8	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	F	A						
Approach Delay (s)	0.0	65.1	0.3			0.0			
Approach LOS	A	F							

Intersection Summary			
Average Delay		4.3	
Intersection Capacity Utilization	33.1%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D
2022 Background Conditions
Synchro Results























HCM Unsignalized Intersection Capacity Analysis
 53: Jones Flats Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	49	8	18	6	4	12	12	760	28	4	589	34
Peak Hour Factor	0.89	0.92	0.32	0.75	0.50	0.50	0.25	0.85	0.70	0.50	0.91	0.61
Hourly flow rate (vph)	55	9	56	8	8	24	48	894	40	8	647	56
Pedestrians	1			1			6			1		
Lane Width (m)	3.7			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			1			0		
Right turn flare (veh)	5			5								
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1212	1655	331	1341	1655	449	648			895		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1212	1655	331	1341	1655	449	648			895		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	54	91	92	91	91	96	95			99		
cM capacity (veh/h)	119	93	667	91	93	562	946			766		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	55	65	8	32	48	447	447	40	8	324	324	56
Volume Left	55	0	8	0	48	0	0	0	8	0	0	0
Volume Right	0	56	0	24	0	0	0	40	0	0	0	56
cSH	119	694	91	372	946	1700	1700	1700	766	1700	1700	1700
Volume to Capacity	0.46	0.09	0.09	0.09	0.05	0.26	0.26	0.02	0.01	0.19	0.19	0.03
Queue Length 95th (m)	15.6	2.3	2.1	2.1	1.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Control Delay (s)	58.8	15.8	48.5	20.6	9.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0
Lane LOS	F	C	E	C	A				A			
Approach Delay (s)	35.5		26.2		0.4				0.1			
Approach LOS	E		D									
Intersection Summary												
Average Delay	3.1											
Intersection Capacity Utilization	39.2%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
55: Bently Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	2	2	6	6	0	0	8	606	2	0	721	10
Peak Hour Factor	0.25	0.25	0.75	0.38	0.25	0.25	0.50	0.92	0.25	0.25	0.92	0.63
Hourly flow rate (vph)	8	8	8	16	0	0	16	659	8	0	784	16
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			5			5						
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1145	1474	392	1087	1474	329	784			659		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1145	1474	392	1087	1474	329	784			659		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	95	94	99	90	100	100	98			100		
cM capacity (veh/h)	154	125	613	160	125	672	696			939		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4		
Volume Total	24	16	16	329	329	8	0	392	392	16		
Volume Left	8	16	16	0	0	0	0	0	0	0		
Volume Right	8	0	0	0	0	8	0	0	0	16		
cSH	209	142	696	1700	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.11	0.11	0.02	0.19	0.19	0.00	0.00	0.23	0.23	0.01		
Queue Length 95th (m)	2.9	2.8	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Control Delay (s)	26.4	33.5	10.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	D	D	B									
Approach Delay (s)	26.4	33.5	0.2									
Approach LOS	D	D										
Intersection Summary												
Average Delay			0.9									
Intersection Capacity Utilization			37.7%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	38	49	55	55	31	16
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	54	70	79	79	44	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	157				296	118
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	157				296	118
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	98
cM capacity (veh/h)	1435				662	939
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	124	157	67			
Volume Left	54	0	44			
Volume Right	0	79	23			
cSH	1435	1700	736			
Volume to Capacity	0.04	0.09	0.09			
Queue Length 95th (m)	0.9	0.0	2.3			
Control Delay (s)	3.5	0.0	10.4			
Lane LOS	A		B			
Approach Delay (s)	3.5	0.0	10.4			
Approach LOS			B			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization		21.6%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	41	40	22	25	55	34
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	53	78	31	42	69	56
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			133		198	95
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			133		198	95
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		91	94
cM capacity (veh/h)			1462		770	959

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	131	73	124
Volume Left	0	31	69
Volume Right	78	0	56
cSH	1700	1462	845
Volume to Capacity	0.08	0.02	0.15
Queue Length 95th (m)	0.0	0.5	3.9
Control Delay (s)	0.0	3.3	10.0
Lane LOS		A	A
Approach Delay (s)	0.0	3.3	10.0
Approach LOS			A

Intersection Summary			
Average Delay		4.5	
Intersection Capacity Utilization	21.7%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
60: Steuart St & Highway 97

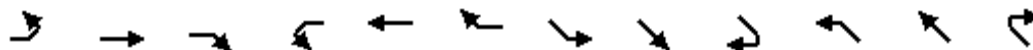
1/10/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	36	24	666	132	84	589
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	26	724	143	91	640
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1298	434			867	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1298	434			867	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	71	95			88	
cM capacity (veh/h)	135	570			772	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	65	483	385	91	320	320
Volume Left	39	0	0	91	0	0
Volume Right	26	0	143	0	0	0
cSH	194	1700	1700	772	1700	1700
Volume to Capacity	0.34	0.28	0.23	0.12	0.19	0.19
Queue Length 95th (m)	10.6	0.0	0.0	3.0	0.0	0.0
Control Delay (s)	32.6	0.0	0.0	10.3	0.0	0.0
Lane LOS	D		B			
Approach Delay (s)	32.6	0.0	1.3			
Approach LOS	D					
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			42.4%		ICU Level of Service	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



























Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↕	↕	↕↕		↕	↕↕	↕
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			7%			7%	
Volume (veh/h)	0	0	0	12	0	12	36	673	0	0	630	36
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	24	0	24	60	732	0	0	685	72
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)							5					
Median type		None		None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1194	1536	366	1171	1536	342	685			732		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1194	1536	366	1171	1536	342	685			732		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	83	100	96	93			100		
cM capacity (veh/h)	130	107	631	140	107	654	905			869		

Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	48	60	488	244	0	342	342	72
Volume Left	0	24	60	0	0	0	0	0	0
Volume Right	0	24	0	0	0	0	0	0	72
cSH	1700	281	905	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.17	0.07	0.29	0.14	0.00	0.20	0.20	0.04
Queue Length 95th (m)	0.0	4.6	1.6	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	23.3	9.3	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	C	A						
Approach Delay (s)	0.0	23.3	0.7			0.0			
Approach LOS	A	C							

Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		























HCM Unsignalized Intersection Capacity Analysis
 53: Jones Flats Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Volume (veh/h)	24	6	30	12	10	12	41	810	8	12	910	47
Peak Hour Factor	0.75	0.38	0.63	0.75	0.42	0.25	0.58	0.90	0.33	0.50	0.92	0.67
Hourly flow rate (vph)	32	16	48	16	24	48	71	900	24	24	989	70
Pedestrians	1			1			6			1		
Lane Width (m)	3.7			3.7			3.7			3.7		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			1			0		
Right turn flare (veh)	5			5								
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1642	2081	502	1599	2081	452	990			901		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1642	2081	502	1599	2081	452	990			901		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	5	66	91	63	49	91	90			97		
cM capacity (veh/h)	34	47	517	44	47	559	706			762		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	32	63	16	72	71	450	450	24	24	495	495	70
Volume Left	32	0	16	0	71	0	0	0	24	0	0	0
Volume Right	0	48	0	48	0	0	0	24	0	0	0	70
cSH	34	189	44	142	706	1700	1700	1700	762	1700	1700	1700
Volume to Capacity	0.95	0.34	0.37	0.51	0.10	0.26	0.26	0.01	0.03	0.29	0.29	0.04
Queue Length 95th (m)	25.6	10.6	9.6	18.4	2.5	0.0	0.0	0.0	0.7	0.0	0.0	0.0
Control Delay (s)	316.8	38.5	128.4	55.6	10.7	0.0	0.0	0.0	9.9	0.0	0.0	0.0
Lane LOS	F	E	F	F	B				A			
Approach Delay (s)	131.9		68.9		0.8				0.2			
Approach LOS	F		F									
Intersection Summary												
Average Delay			8.7									
Intersection Capacity Utilization			48.9%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 55: Bently Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	0	8	6	2	2	10	840	18	0	775	10
Peak Hour Factor	0.31	0.25	0.50	0.25	0.25	0.25	0.25	0.89	0.56	0.25	0.86	0.63
Hourly flow rate (vph)	32	0	16	24	8	8	40	944	32	0	901	16
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			5			5						
Median type		None		None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1457	1925	451	1474	1925	472	901			944		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1457	1925	451	1474	1925	472	901			944		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	59	100	97	71	87	99	95			100		
cM capacity (veh/h)	79	64	561	84	64	544	763			735		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4		
Volume Total	48	40	40	472	472	32	0	451	451	16		
Volume Left	32	24	40	0	0	0	0	0	0	0		
Volume Right	16	8	0	0	0	32	0	0	0	16		
cSH	118	98	763	1700	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.41	0.41	0.05	0.28	0.28	0.02	0.00	0.27	0.27	0.01		
Queue Length 95th (m)	13.1	12.7	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Control Delay (s)	56.5	65.5	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	F	F	A									
Approach Delay (s)	56.5	65.5	0.4				0.0					
Approach LOS	F	F										
Intersection Summary												
Average Delay			2.8									
Intersection Capacity Utilization			41.2%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↔		↕	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	10	40	74	34	31	16
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	14	57	106	49	44	23
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	154				216	130
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	154				216	130
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				94	98
cM capacity (veh/h)	1438				758	925
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	71	154	67			
Volume Left	14	0	44			
Volume Right	0	49	23			
cSH	1438	1700	808			
Volume to Capacity	0.01	0.09	0.08			
Queue Length 95th (m)	0.2	0.0	2.1			
Control Delay (s)	1.6	0.0	9.9			
Lane LOS	A		A			
Approach Delay (s)	1.6	0.0	9.9			
Approach LOS			A			
Intersection Summary						
Average Delay			2.6			
Intersection Capacity Utilization		19.5%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	31	40	46	53	55	28
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	40	78	66	88	69	46
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			120		301	82
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			120		301	82
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		90	95
cM capacity (veh/h)			1478		657	975

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	118	154	115
Volume Left	0	66	69
Volume Right	78	0	46
cSH	1700	1478	756
Volume to Capacity	0.07	0.04	0.15
Queue Length 95th (m)	0.0	1.1	4.1
Control Delay (s)	0.0	3.4	10.6
Lane LOS		A	B
Approach Delay (s)	0.0	3.4	10.6
Approach LOS			B

Intersection Summary			
Average Delay		4.5	
Intersection Capacity Utilization	24.3%	ICU Level of Service	A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 60: Steuart St & Highway 97

1/10/2013



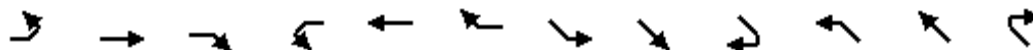
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵		↕↵		↵	↕↕
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	96	78	786	60	24	840
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	85	854	65	26	913
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1396	460			920	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1396	460			920	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	18	85			96	
cM capacity (veh/h)	128	548			738	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	189	570	350	26	457	457
Volume Left	104	0	0	26	0	0
Volume Right	85	0	65	0	0	0
cSH	194	1700	1700	738	1700	1700
Volume to Capacity	0.97	0.34	0.21	0.04	0.27	0.27
Queue Length 95th (m)	61.5	0.0	0.0	0.8	0.0	0.0
Control Delay (s)	107.6	0.0	0.0	10.1	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	107.6	0.0		0.3		
Approach LOS	F					

Intersection Summary						
Average Delay			10.1			
Intersection Capacity Utilization		42.3%		ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↕	↕	↕↕		↕	↕↕	↕
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			7%			7%	
Volume (veh/h)	0	0	0	48	0	28	18	792	0	0	840	24
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	96	0	56	30	861	0	0	913	48
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)								5				
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1377	1834	430	1403	1834	457	913			861		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1377	1834	430	1403	1834	457	913			861		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	90	96			100		
cM capacity (veh/h)	91	72	573	96	72	551	742			777		

Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	152	30	574	287	0	457	457	48
Volume Left	0	96	30	0	0	0	0	0	0
Volume Right	0	56	0	0	0	0	0	0	48
cSH	1700	150	742	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	1.01	0.04	0.34	0.17	0.00	0.27	0.27	0.03
Queue Length 95th (m)	0.0	58.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	136.1	10.1	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	F	B						
Approach Delay (s)	0.0	136.1	0.3			0.0			
Approach LOS	A	F							

Intersection Summary			
Average Delay		10.5	
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)		15	

*BENTLEY RD INDUSTRIAL PARK
TRAFFIC IMPACT ASSESSMENT*

APPENDIX E
2022 Post Development Conditions
Synchro Results

BENTLEY RD INDUSTRIAL PARK
TRAFFIC IMPACT ASSESSMENT

Table 11 and Table 12 show the conditions at Highway 97 / Bentley Rd and Highway 97 / Jones Flat Rd. At Bentley Rd, eastbound and westbound volumes are failing in the AM, however, volumes are low and do not warrant a change in traffic control.

Table 11: Post Development 2022 AM Peak Hour Traffic Conditions at Highway 97 / Bentley Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	12.4	0	0	-	0	0	76.0	76.0	76.0	83.1	-	-
LOS	B	A	A	-	A	A	F	F	F	F	-	-
Queue	4.7	0	0	-	0	0	21.1	21.1	21.1	6.8	-	-
V/C	0.17	0.20	0.00	-	0.28	0.05	0.58	0.58	0.58	0.26	-	-

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

Table 12: Post Development 2022 AM Peak Hour Traffic Conditions at Highway 97 / Jones Flat Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	11.1	4.3	1.4	3.5	3.8	1.1	25.3	21.9	8.8	22.3	22.1	11.7
LOS	B	A	A	A	A	A	C	C	A	C	C	B
Queue	5.2	29.5	1.4	0.7	22.1	0	20.0	5.7	6.2	3.7	8.1	1.9
V/C	0.59	0.39	0.04	0.02	0.28	0.30	0.34	0.04	0.26	0.04	0.17	0.09

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

During the PM peak hour, high through movement on Highway 97 create poor LOS at westbound Stuart St and Bentley Rd. Trips assigned to these roads have been diverted to Jones Flat Rd where there is a signal. There are 138 eastbound trips diverted from Bentley Rd to Jones Flat Rd and 107 westbound trips from Stuart St diverted to Jones Flat Rd. The traffic signal at Highway 97 / Jones Flat Rd will operate at a LOS B with the diverted traffic.

There are failing LOS for westbound Sumac Ridge Dr during the PM peak hour however, the turning volumes are low and to not warrant an upgrade in traffic control.

BENTLEY RD INDUSTRIAL PARK
TRAFFIC IMPACT ASSESSMENT

Table 13: Post Development 2022 PM Peak Hour Traffic Conditions at Highway 97 / Bentley Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	10.2	0	0	-	0	0	79.4	-	79.4	101	101	101
LOS	B	A	A	-	A	A	F	-	F	F	F	F
Queue	1.7	0	0	-	0	0	17.4	-	17.4	17.5	17.5	17.5
V/C	0.17	0.20	0.00	-	0.28	0.05	0.52	-	0.52	0.54	0.54	0.54

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

Table 14: Post Development 2022 PM Peak Hour Traffic Conditions at Highway 97 / Jones Flat Rd

	Northbound			Southbound			Eastbound			Westbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Delay	16.7	9.0	3.1	7.4	10.0	2.1	21.5	14.9	16.2	19.2	14.7	6.4
LOS	B	A	A	A	A	A	C	B	B	B	B	A
Queue	9.1	44.3	0.2	2.2	53.6	2.3	34.0	6.5	24.6	25.7	3.8	0
V/C	0.48	0.53	0.04	0.09	0.61	0.12	0.55	0.14	0.64	0.42	0.06	0.10

Note: Delay refers to total delay in seconds; Queue is 95th percentile queue in metres; and V/C is volume-to-capacity ratio

HCM Signalized Intersection Capacity Analysis

53: Jones Flats Rd & Highway 97

1/10/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	0.99	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	1820	1509	1714	1820	1526	1727	3262	1210	1728	3262	1512
Flt Permitted	0.72	1.00	1.00	0.75	1.00	1.00	0.39	1.00	1.00	0.30	1.00	1.00
Satd. Flow (perm)	1317	1820	1509	1352	1820	1526	713	3262	1210	543	3262	1512
Volume (vph)	63	11	26	6	25	12	74	781	28	4	616	221
Peak-hour factor, PHF	0.89	0.92	0.32	0.75	0.50	0.50	0.25	0.85	0.70	0.50	0.91	0.61
Adj. Flow (vph)	71	12	81	8	50	24	296	919	40	8	677	362
RTOR Reduction (vph)	0	0	71	0	0	21	0	0	9	0	0	79
Lane Group Flow (vph)	71	12	10	8	50	3	296	919	31	8	677	283
Confl. Peds. (#/hr)	1		6	6		1	1		1	1		1
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	6%	25%	0%	6%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	8.4	8.4	8.4	8.4	8.4	8.4	61.6	61.6	61.6	61.6	61.6	61.6
Effective Green, g (s)	9.4	9.4	9.4	9.4	9.4	9.4	62.6	62.6	62.6	62.6	62.6	62.6
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.12	0.12	0.78	0.78	0.78	0.78	0.78	0.78
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	155	214	177	159	214	179	558	2553	947	425	2553	1183
v/s Ratio Prot		0.01			0.03			0.28			0.21	
v/s Ratio Perm	c0.05		0.01	0.01		0.00	c0.41		0.03	0.01		0.19
v/c Ratio	0.46	0.06	0.05	0.05	0.23	0.02	0.53	0.36	0.03	0.02	0.27	0.24
Uniform Delay, d1	32.9	31.4	31.4	31.3	32.0	31.2	3.2	2.6	1.9	1.9	2.4	2.3
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	2.1	0.1	0.1	0.1	0.6	0.0	3.6	0.4	0.1	0.1	0.3	0.5
Delay (s)	35.1	31.5	31.5	31.5	32.6	31.2	6.8	3.0	2.0	2.0	2.6	2.8
Level of Service	D	C	C	C	C	C	A	A	A	A	A	A
Approach Delay (s)		33.0			32.1			3.9			2.7	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM Average Control Delay			6.2	HCM Level of Service				A				
HCM Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			80.0	Sum of lost time (s)				8.0				
Intersection Capacity Utilization			47.0%	ICU Level of Service				A				
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
55: Bently Rd & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕	↗	↗	↕	↗
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	5	17	6	0	0	50	617	2	0	887	52
Peak Hour Factor	0.25	0.25	0.75	0.38	0.25	0.25	0.50	0.92	0.25	0.25	0.92	0.63
Hourly flow rate (vph)	20	20	23	16	0	0	100	671	8	0	964	83
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			5			5						
Median type		None		None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1499	1835	482	1363	1835	335	964			671		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1499	1835	482	1363	1835	335	964			671		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.6			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.5			2.2		
p0 queue free %	73	69	96	77	100	100	83			100		
cM capacity (veh/h)	75	64	536	69	64	666	585			929		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	63	16	100	335	335	8	0	482	482	83
Volume Left	20	16	100	0	0	0	0	0	0	0
Volume Right	23	0	0	0	0	8	0	0	0	83
cSH	108	61	585	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.58	0.26	0.17	0.20	0.20	0.00	0.00	0.28	0.28	0.05
Queue Length 95th (m)	21.1	6.8	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	76.0	83.1	12.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	F	B							
Approach Delay (s)	76.0	83.1	1.6				0.0			
Approach LOS	F	F								

Intersection Summary											
Average Delay			3.8								
Intersection Capacity Utilization			44.5%		ICU Level of Service				A		
Analysis Period (min)			15								

HCM Unsignalized Intersection Capacity Analysis
 58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	59	49	55	366	65	22
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	84	70	79	523	93	31
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	601				579	340
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	601				579	340
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				79	96
cM capacity (veh/h)	986				432	707

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	154	601	124
Volume Left	84	0	93
Volume Right	0	523	31
cSH	986	1700	479
Volume to Capacity	0.09	0.35	0.26
Queue Length 95th (m)	2.1	0.0	7.8
Control Delay (s)	5.3	0.0	15.1
Lane LOS	A		C
Approach Delay (s)	5.3	0.0	15.1
Approach LOS			C

Intersection Summary			
Average Delay		3.1	
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	66	48	22	295	97	34
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	85	94	31	492	121	56
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None		
Median storage (veh)						
Upstream signal (m)				315		
pX, platoon unblocked						
vC, conflicting volume			181		688	135
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			181		688	135
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		70	94
cM capacity (veh/h)			1404		401	912

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	179	523	177
Volume Left	0	31	121
Volume Right	94	0	56
cSH	1700	1404	486
Volume to Capacity	0.11	0.02	0.36
Queue Length 95th (m)	0.0	0.5	12.5
Control Delay (s)	0.0	0.7	16.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.7	16.6
Approach LOS			C

Intersection Summary			
Average Delay		3.7	
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
60: Steuart St & Highway 97

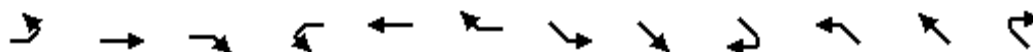
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Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↕↔		↔	↕↕
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Volume (veh/h)	57	45	698	135	85	763
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	62	49	759	147	92	829
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)	309					
pX, platoon unblocked	1.00	1.00			1.00	
vC, conflicting volume	1432	453			905	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1430	449			903	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	44	91			88	
cM capacity (veh/h)	110	556			747	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	111	506	400	92	415	415
Volume Left	62	0	0	92	0	0
Volume Right	49	0	147	0	0	0
cSH	170	1700	1700	747	1700	1700
Volume to Capacity	0.65	0.30	0.24	0.12	0.24	0.24
Queue Length 95th (m)	28.4	0.0	0.0	3.2	0.0	0.0
Control Delay (s)	59.1	0.0	0.0	10.5	0.0	0.0
Lane LOS	F		B			
Approach Delay (s)	59.1	0.0	1.1			
Approach LOS	F					
Intersection Summary						
Average Delay	3.9					
Intersection Capacity Utilization	46.1%		ICU Level of Service			A
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↗	↗	↗	↕		↗	↕
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			7%			7%	
Volume (veh/h)	0	0	0	12	0	12	36	850	0	0	683	36
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	24	0	24	60	924	0	0	742	72
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)							5					
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1415	1786	462	1324	1786	371	742			924		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1415	1786	462	1324	1786	371	742			924		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	78	100	96	93			100		
cM capacity (veh/h)	89	75	547	108	75	626	861			735		

























Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	48	60	616	308	0	371	371	72
Volume Left	0	24	60	0	0	0	0	0	0
Volume Right	0	24	0	0	0	0	0	0	72
cSH	1700	216	861	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.22	0.07	0.36	0.18	0.00	0.22	0.22	0.04
Queue Length 95th (m)	0.0	6.3	1.7	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	29.3	9.5	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	D	A						
Approach Delay (s)	0.0	29.3	0.6			0.0			
Approach LOS	A	D							

Intersection Summary		
Average Delay		1.1
Intersection Capacity Utilization	41.5%	ICU Level of Service
Analysis Period (min)		15
		A

HCM Signalized Intersection Capacity Analysis

53: Jones Flats Rd & Highway 97























1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.98	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)	1728	1820	1518	1721	1820	1527	1729	3262	1211	1728	3262	1514
Flt Permitted	0.74	1.00	1.00	0.71	1.00	1.00	0.21	1.00	1.00	0.27	1.00	1.00
Satd. Flow (perm)	1340	1820	1518	1282	1820	1527	389	3262	1211	485	3262	1514
Volume (vph)	162	29	214	119	13	12	60	813	8	12	956	69
Peak-hour factor, PHF	0.75	0.38	0.63	0.75	0.42	0.25	0.58	0.90	0.33	0.50	0.92	0.67
Adj. Flow (vph)	216	76	340	159	31	48	103	903	24	24	1039	103
RTOR Reduction (vph)	0	0	89	0	0	34	0	0	11	0	0	49
Lane Group Flow (vph)	216	76	251	159	31	14	103	903	13	24	1039	54
Confl. Peds. (#/hr)	1		6	6		1	1		1	1		1
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	6%	25%	0%	6%	0%
Turn Type	Perm		Perm	Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	12.6	12.6	12.6	12.6	12.6	12.6	23.1	23.1	23.1	23.1	23.1	23.1
Effective Green, g (s)	13.6	13.6	13.6	13.6	13.6	13.6	24.1	24.1	24.1	24.1	24.1	24.1
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.30	0.30	0.53	0.53	0.53	0.53	0.53	0.53
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	399	542	452	382	542	454	205	1720	639	256	1720	798
v/s Ratio Prot		0.04			0.02			0.28			c0.32	
v/s Ratio Perm	0.16		c0.17	0.12		0.01	0.26		0.01	0.05		0.04
v/c Ratio	0.54	0.14	0.56	0.42	0.06	0.03	0.50	0.53	0.02	0.09	0.60	0.07
Uniform Delay, d1	13.4	11.8	13.5	12.9	11.5	11.4	6.9	7.1	5.2	5.4	7.5	5.3
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	1.5	0.1	1.5	0.7	0.0	0.0	1.9	0.3	0.0	0.2	0.6	0.0
Delay (s)	14.9	11.9	15.0	13.6	11.5	11.4	8.9	7.4	5.2	5.5	8.1	5.3
Level of Service	B	B	B	B	B	B	A	A	A	A	A	A
Approach Delay (s)		14.6			12.9			7.5			7.8	
Approach LOS		B			B			A			A	
Intersection Summary												
HCM Average Control Delay	9.5			HCM Level of Service				A				
HCM Volume to Capacity ratio	0.59											
Actuated Cycle Length (s)	45.7			Sum of lost time (s)				8.0				
Intersection Capacity Utilization	59.5%			ICU Level of Service				B				
Analysis Period (min)	15											

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
55: Bently Rd & Highway 97

1/10/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	0	8	6	2	2	13	955	18	0	794	16
Peak Hour Factor	0.31	0.25	0.50	0.25	0.25	0.25	0.25	0.89	0.56	0.25	0.86	0.63
Hourly flow rate (vph)	32	0	16	24	8	8	52	1073	32	0	923	25
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)			5			5						
Median type	None			None								
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1568	2100	462	1639	2100	537	923			1073		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1568	2100	462	1639	2100	537	923			1073		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	48	100	97	61	84	98	93			100		
cM capacity (veh/h)	62	49	552	62	49	494	748			657		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4		
Volume Total	48	40	52	537	537	32	0	462	462	25		
Volume Left	32	24	52	0	0	0	0	0	0	0		
Volume Right	16	8	0	0	0	32	0	0	0	25		
cSH	93	74	748	1700	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.52	0.54	0.07	0.32	0.32	0.02	0.00	0.27	0.27	0.01		
Queue Length 95th (m)	17.4	17.5	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Control Delay (s)	79.4	101.0	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	F	F	B									
Approach Delay (s)	79.4	101.0	0.5									
Approach LOS	F	F										
Intersection Summary												
Average Delay			3.8									
Intersection Capacity Utilization			44.5%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 58: Jones Flats Rd & Bentley Rd

1/10/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	41	40	74	84	445	62
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70
Hourly flow rate (vph)	59	57	106	120	636	89
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						4
Median type					None	
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	226				340	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	226				340	166
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				0	90
cM capacity (veh/h)	1355				622	884

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	116	226	724
Volume Left	59	0	636
Volume Right	0	120	89
cSH	1355	1700	665
Volume to Capacity	0.04	0.13	1.09
Queue Length 95th (m)	1.0	0.0	156.8
Control Delay (s)	4.1	0.0	86.0
Lane LOS	A		F
Approach Delay (s)	4.1	0.0	86.0
Approach LOS			F

Intersection Summary			
Average Delay		58.9	
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
 59: Jones Flats Rd & Victoria Road

1/10/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	↻
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	376	109	46	97	55	28
Peak Hour Factor	0.78	0.51	0.70	0.60	0.80	0.61
Hourly flow rate (vph)	482	214	66	162	69	46
Pedestrians				1	2	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)	315					
pX, platoon unblocked						
vC, conflicting volume			698		884	592
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			698		884	592
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		76	91
cM capacity (veh/h)			906		291	505
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	696	227	115			
Volume Left	0	66	69			
Volume Right	214	0	46			
cSH	1700	906	351			
Volume to Capacity	0.41	0.07	0.33			
Queue Length 95th (m)	0.0	1.8	10.6			
Control Delay (s)	0.0	3.2	20.2			
Lane LOS		A	C			
Approach Delay (s)	0.0	3.2	20.2			
Approach LOS			C			
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			51.3%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
60: Stuart St & Highway 97

1/10/2013



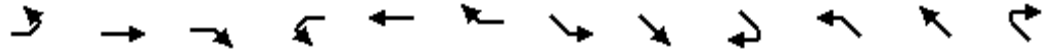
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔		↑↔		↔	↑↑
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Volume (veh/h)	20	78	903	83	47	905
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	85	982	90	51	984
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)	309					
pX, platoon unblocked	0.93	0.93			0.93	
vC, conflicting volume	1621	536			1072	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1593	428			1003	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	74	84			92	
cM capacity (veh/h)	84	536			639	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	107	654	417	51	492	492
Volume Left	22	0	0	51	0	0
Volume Right	85	0	90	0	0	0
cSH	255	1700	1700	639	1700	1700
Volume to Capacity	0.42	0.38	0.25	0.08	0.29	0.29
Queue Length 95th (m)	14.8	0.0	0.0	2.0	0.0	0.0
Control Delay (s)	28.9	0.0	0.0	11.1	0.0	0.0
Lane LOS	D			B		
Approach Delay (s)	28.9	0.0		0.5		
Approach LOS	D					

Intersection Summary						
Average Delay			1.6			
Intersection Capacity Utilization	48.7%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 61: Sumac Ridge Lane & Highway 97

1/10/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕	↗	↗	↗	↕		↗	↕
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			7%			7%	
Volume (veh/h)	0	0	0	48	0	28	18	880	0	0	999	24
Peak Hour Factor	0.92	0.92	0.92	0.50	0.92	0.50	0.60	0.92	0.92	0.92	0.92	0.50
Hourly flow rate (vph)	0	0	0	96	0	56	30	957	0	0	1086	48
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)							5					
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1559	2102	478	1624	2102	543	1086			957		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1559	2102	478	1624	2102	543	1086			957		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	0	100	88	95			100		
cM capacity (veh/h)	65	49	533	66	49	484	638			715		

Direction, Lane #	EB 1	WB 1	SE 1	SE 2	SE 3	NW 1	NW 2	NW 3	NW 4
Volume Total	0	152	30	638	319	0	543	543	48
Volume Left	0	96	30	0	0	0	0	0	0
Volume Right	0	56	0	0	0	0	0	0	48
cSH	1700	100	638	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	1.53	0.05	0.38	0.19	0.00	0.32	0.32	0.03
Queue Length 95th (m)	0.0	87.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	356.1	10.9	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	A	F	B						
Approach Delay (s)	0.0	356.1	0.3			0.0			
Approach LOS	A	F							

Intersection Summary			
Average Delay		24.0	
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		