

Appendix B

ARMSTRONG COTTAM

DEVELOPMENT

TRAFFIC IMPACT STUDY



RC SPENCER ASSOCIATES INC.
Consulting Engineers

Windsor: 800 University Ave. W. - Windsor ON N9A 5R9
Leamington: 18 Talbot St. W. - Leamington ON N8H 1M4
Chatham-Kent: 138 King St. W. Unit 102 - Chatham ON N7M 1E3

INTRODUCTION AND BACKGROUND

A residential development has been proposed for lands in the Community of Cottam on the north side of County Road 34 east of County Road 27. The proposed development is situated in the Town of Kingsville, in the County of Essex. The area is illustrated on Figure 1.

The proposed site plan consists of 32 single family detached housing units, as illustrated on Figure 2. The proposed residential development is situated behind existing residential units, with one access point into and out of the development onto County Road 34.

It has been requested that the study take account of the undeveloped lands to the north of this development. Figure 3 illustrates the location of these presently undeveloped lands. It is assumed that these lands will eventually be developed to consist of 47 single family detached housing units. Realistically, all of the future developed lands will access County Road 27 and County Road 34 by Whitewood Road and the Belleview Drive extension respectively. Greenwood Avenue will not likely be used by any of the trips generated by the proposed developments.

County Road 34 and County Road 27 are arterial roads with a County of Essex County Road status. Within the study area of this report, the intersection of these two roadways is stop-controlled with County Road 34 having the right-of-way.

The purpose of this study is to examine the traffic implications of the proposed developments on traffic operations in the area, particularly on the intersection of County Road 34 and County Road 27.

EXISTING CONDITIONS

Turning movement counts were obtained on Wednesday, December 20, 2017, for the intersection of County Road 34 at County Road 27, as provided in Appendix A. These counts were analyzed in the Synchro 10 program, which calculates various parameters of intersection performance such as Level of Service (LOS) and Intersection Capacity Utilization (ICU).

The results of the analysis show that the intersection of County Road 34 at County Road 27 is performing very well in the PM peak time period, with an overall LOS A during the peak hour. The ICU is 39.5% in the PM peak hour.

TRIP GENERATION AND DISTRIBUTION

The proposed development contains one type of land use. ITE Land Use Code 210 (Single-Family Detached Housing) is the most appropriate code for this use. The respective land use code can be found in Appendix B. Trips under this land use code are typical for the expected use of the proposed residential area. It provides generation rates of 0.99 trips per unit in the PM peak hour with 63% in and 37% out. The AM peak was not considered because the trip generation rate is much lower, with 0.74 trips generated per unit. Likewise, the same land use code also applies to the adjacent undeveloped land. Again, it provides generation rates of 0.99 trips per unit in the PM peak hour with 63% in and 37% out.

The basis of the trip distribution assumptions is the turning movement count data obtained on Wednesday, December 20, 2017 for this location. The ratio of westbound to eastbound movements at the intersection of County Road 34 and County Road 27 formed the basis of the distribution to and from the proposed site. The ratios of turning movements by approach were the basis of distributing the site generated trips at the identified intersection. At full build-out, all trips to and from the north are expected to use the Whitewood Road access onto County Road 27, while all trips to and from the south, east, and west are expected to use the proposed Belleview Drive extension onto County Road 34.

When these estimates of trip distribution are applied to the trip generation estimates as previously summarized, the turning movements illustrated on Figure 4 - Site Generated Traffic result. These numbers have been added to existing and future volumes in order to analyze the traffic impact of the proposed developments.

CAPACITY AND LEVEL OF SERVICE ANALYSIS

Figure 5A illustrates the existing traffic volumes for the PM peak hour for the intersection of County Road 34 and County Road 27. Subsequently, Figure 5B illustrates the anticipated traffic volumes for the PM peak hour when site generated traffic is added to the existing traffic at the aforementioned intersection.

In order to accommodate future growth, existing volumes have been increased across the board by 10%, which would be approximately equal to growth in the range of 1% per year compounded over 10 years. Site generated traffic was added to this future estimate, and the results are presented in Figure 5C.

The data summarized in Figures 5A to 5C were used in the Synchro analysis of intersection performance. The results are summarized in tabular form in Figure 6 - Intersection Performance Summaries and in detailed form in Appendix C - Detailed Synchro Results. Each Synchro report found in Appendix C corresponds to an aforementioned figure reference.

From the summary table in Figure 6, for this intersection, it is observed that the addition of site traffic to existing traffic conditions does not change the LOS A rating, nor does it change for the future and site generated traffic conditions. In the future growth scenario, the ICU for the County Road 34 and County Road 27 intersection is 44.5%. Therefore, no traffic operations concerns stemming from the development of the proposed site can be anticipated, as the proposed development does not add a significant amount of vehicular activity to on-street traffic conditions in either the immediate or future peak hour scenarios.

SITE-SPECIFIC TRAFFIC SAFETY CONSIDERATIONS

Regarding the safety of site-specific traffic operations, it is noted that the access to the proposed residential development is about 90m southeast of the Clark Street at County Road 34 intersection. To determine if existing geometries could pose a traffic safety hazard, the Transportation Association of Canada's Geometric Design Guide for Canadian Roads was used as a reference. From the manual, for a design speed of 50 km/h, intersection sight distance of 104m is considered sufficient for safe operations at the site access. The corresponding calculations for intersection sight distance can be found in Appendix D.

Based on existing geometries, there is no obstruction to sight lines, and both Clark Street and the proposed Bellevue Drive extension to County Road 34 will be able to operate safely and independently of each other. Therefore, daylight corners are not necessary at the proposed Bellevue Drive access to County Road 34.

Additionally, it should be noted that, given the anticipated low turning volumes at Whitewood Road and Greenwood Avenue at County Road 27, there is no concern regarding safe traffic operations at these two intersections. Both intersections will continue to operate very similarly to status quo.

SUMMARY AND CONCLUSIONS

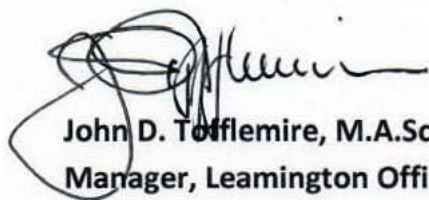
A residential development has been proposed for lands just east of the intersection of County Road 34 and County Road 27, consisting of 32 single family detached housing units. Future trip generation of the presently undeveloped lands to the north of this proposed development were also considered.

Using recently obtained turning movement counts and the best available trip generation and distribution data, an analysis was completed to measure the operational impact of the development on conditions at the stop-controlled intersection of County Road 34 and County Road 27. The results indicate that the intersection will continue to operate at a very good level of service under full site development, even with future traffic growth of 10% above existing.

Since intersection sight distance of 104m is considered sufficient for safe operations at the site access and there is no obstruction to sight lines, both Clark Street and the proposed Bellevue Drive extension to County Road 34 will be able to operate safely and independently of each other. Therefore, daylight corners are not necessary at the proposed Bellevue Drive access to County Road 34. Also, both Whitewood Road and Greenwood Avenue at County Road 27 will continue to operate very similarly to status quo with no concern regarding safe traffic operations.

All of which is respectfully submitted,

RC Spencer Associates Inc.



John D. Tofflemire, M.A.Sc., P. Eng.
Manager, Leamington Office







RC SPENCER ASSOCIATES INC.

Consulting Engineers

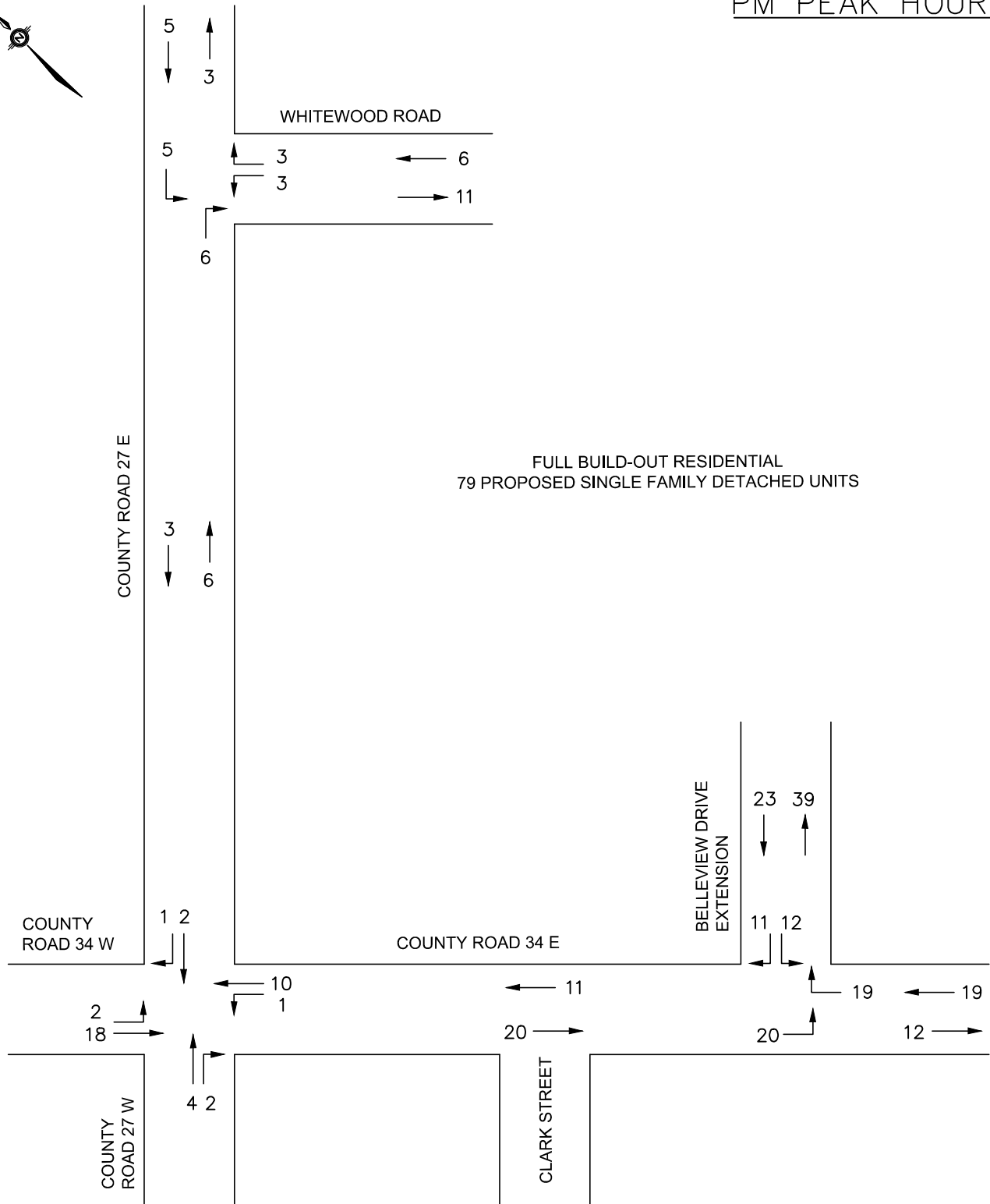
Windsor 820 University Ave. W. Windsor ON N9A 5R9
Leamington 18 Talbot St. W. Leamington ON N8H 1M4
Chatham-Kent 138 King St. W. Unit 102 - Chatham ON N7M 1E3

Professional Engineers
Ontario

					DESIGN	A.D.B.
					CHECKED	J.T.
					DRAWN	A.D.B.
					CHECKED	J.T.
1.	COMPLETED REPORT FIGURES	DEC 22 2017	A.D.B.	J.T.	DATE	JANUARY 2018
NO.	REVISION	DATE	BY	APP	SCALE	N.T.S.

ARMSTRONG COTTAM DEVELOPMENT	PROJECT NO. 17-657
PLAN OF UNDEVELOPED NORTHERLY LANDS	FIGURE NO. 3
	OF 6

PM PEAK HOUR



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Leamington: 18 Talbot St. W. - Leamington ON N8H 1M4
Chatham-Kent: 138 King St. W. Unit 102 - Chatham ON N7M 1E3



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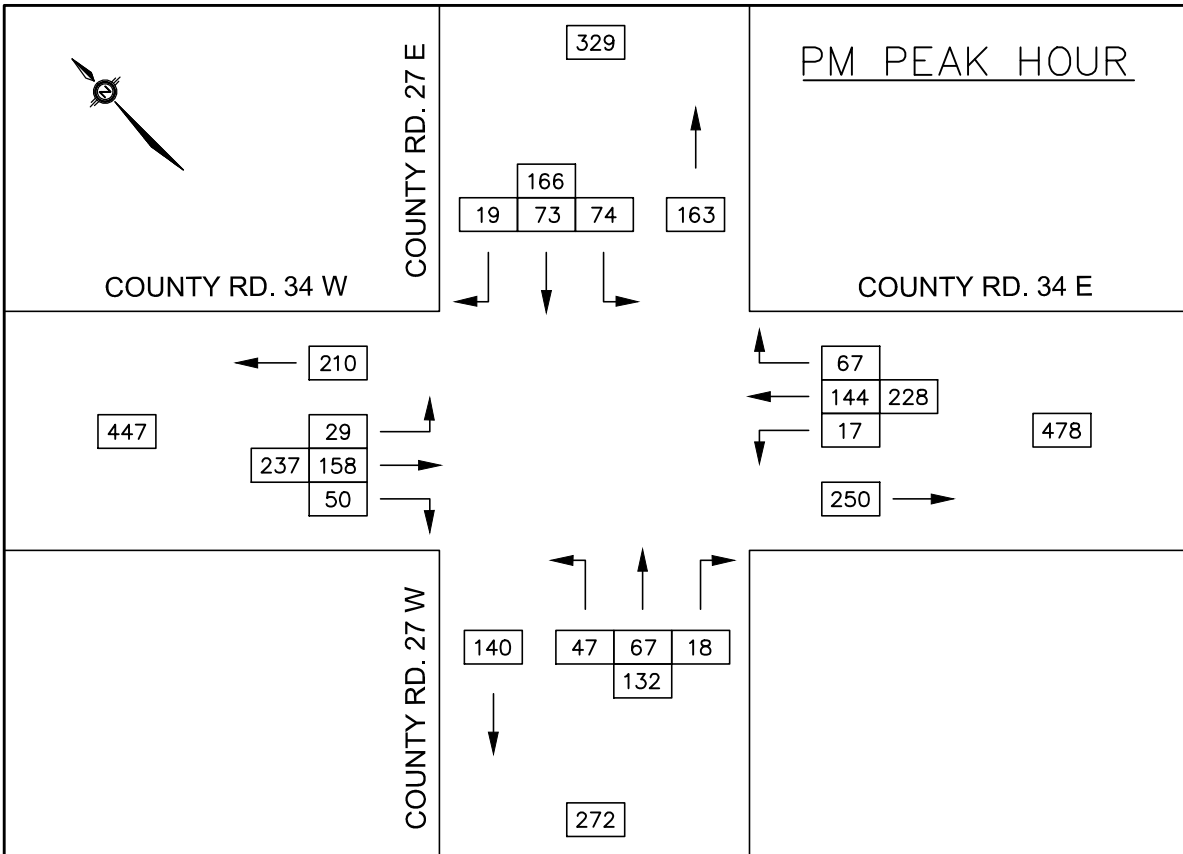
ARMSTRONG COTTAM DEVELOPMENT

SITE GENERATED TRAFFIC

PROJECT NO.
17-657

FIGURE NO.
4

OF
6



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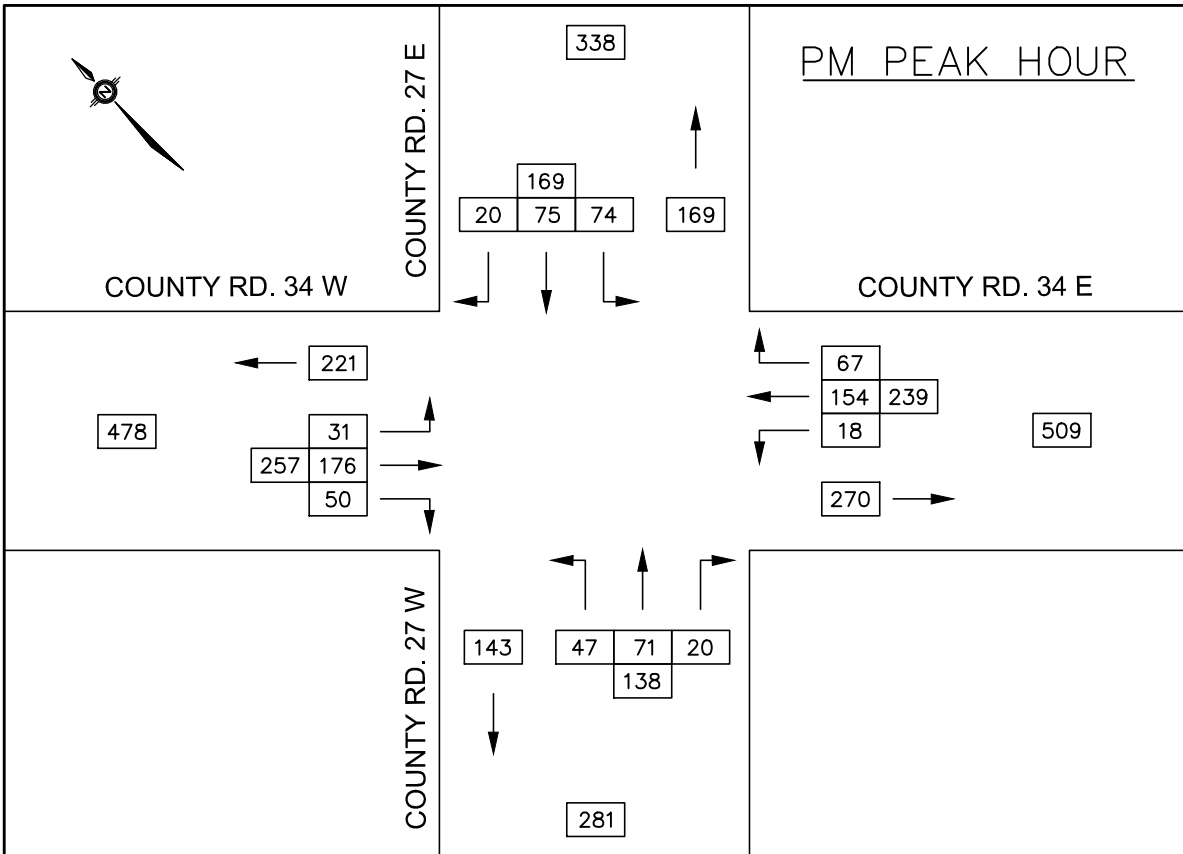
ARMSTRONG COTTAM DEVELOPMENT

C.R. 27 / C.R. 34
EXISTING TRAFFIC

PROJECT NO.
17-657

FIGURE NO.
5A

OF
6



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Chatham-Kent: 138 King St. W. Unit 102 - Chatham ON N7M 1E3



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DATE JANUARY 2017

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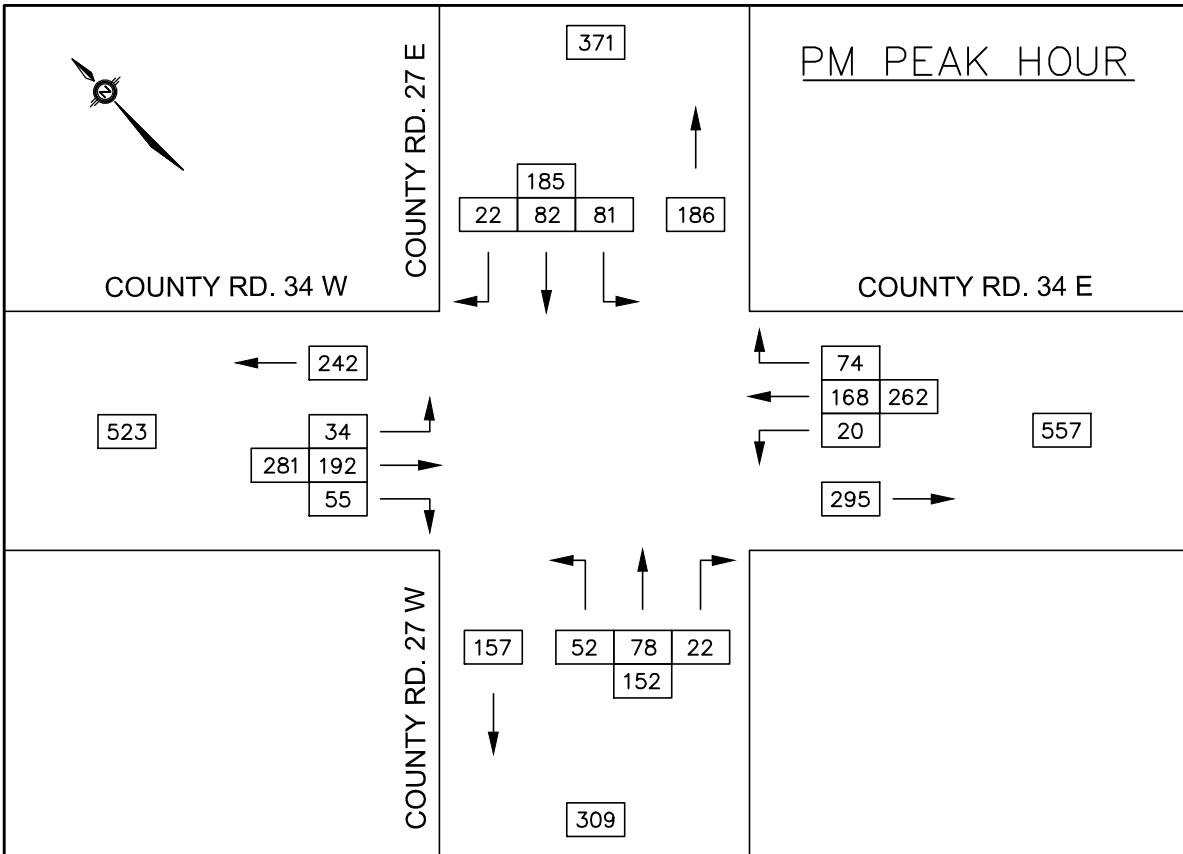
ARMSTRONG COTTAM DEVELOPMENT

C.R. 27 / C.R. 34
EXISTING + SITE GENERATED TRAFFIC

PROJECT NO.
17-657

FIGURE NO.
5B

OF
6



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DATE JANUARY 2017

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ARMSTRONG COTTAM DEVELOPMENT

C.R. 27 / C.R. 34
EXISTING & 10% INCREASE
+ SITE GENERATED TRAFFIC

PROJECT NO.
17-657

FIGURE NO.
5C

OF
6

Intersection Performance Summary

		County Road 27 @ County Road 34	
		LOS	ICU
Existing	AM	N/A	N/A
	PM	A	39.5%
Existing & Site Generated	AM	N/A	N/A
	PM	A	41.4%
Future & Site Generated	AM	N/A	N/A
	PM	A	44.5%



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ARMSTRONG COTTAM DEVELOPMENT

INTERSECTION PERFORMANCE SUMMARY

PROJECT NO.
17-657

FIGURE NO.
6

OF
6

Appendix A

TRAFFIC COUNTS



RC SPENCER ASSOCIATES INC.
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Windsor: 800 University Ave. W. - Windsor ON N9A 5R9
Leamington: 18 Talbot St. W. - Leamington ON N8H 1M4
Chatham-Kent: 138 King St. W. Unit 102 - Chatham ON N7M 1E3

Date: December 20, 2017
Counted by: Robert Botham
Weather Conditions: Clear
Intersection: CR34 at CR27

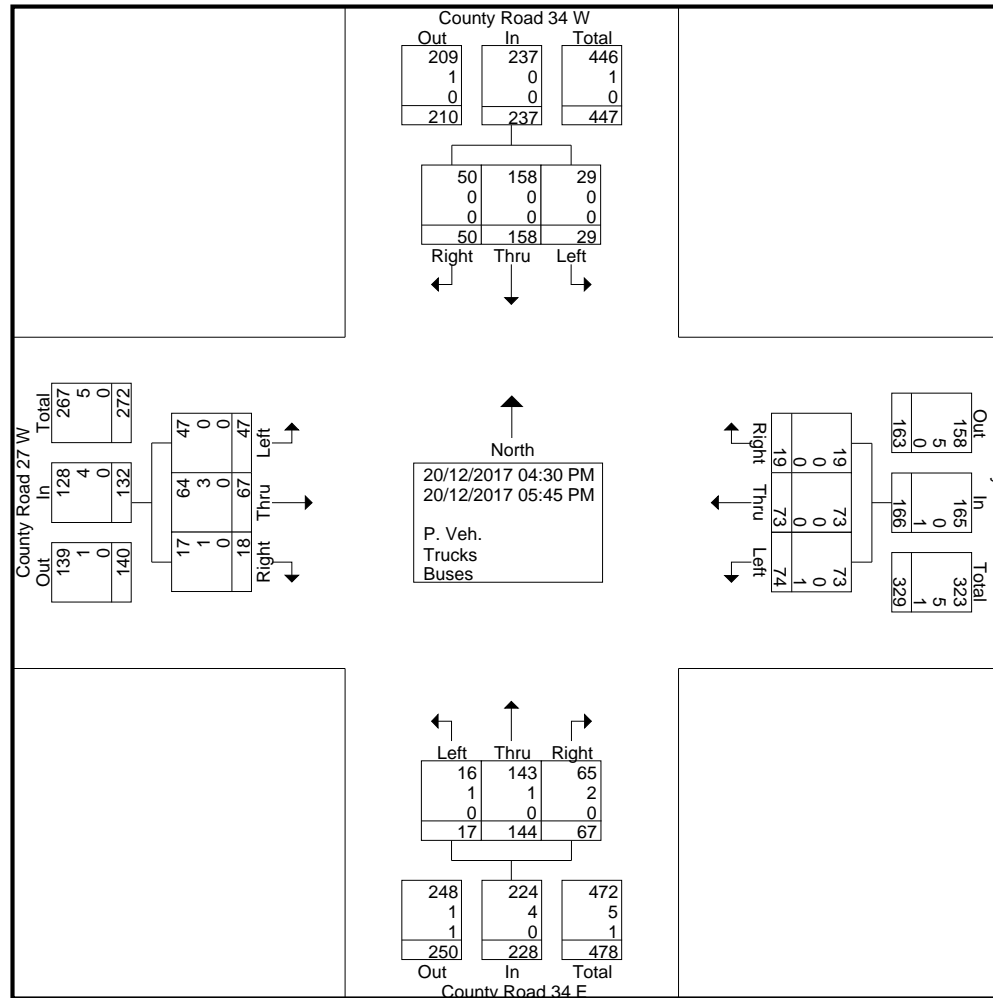
Groups Printed- P. Veh. - Trucks - Buses

	County Road 34 E N/B				County Road 34 W S/B				County Road 27 W E/B				County Road 27 E W/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
04:30 PM	8	29	2	39	7	22	5	34	1	13	10	24	5	15	11	31	128
04:45 PM	12	23	4	39	6	28	8	42	6	11	11	28	4	15	12	31	140
Total	20	52	6	78	13	50	13	76	7	24	21	52	9	30	23	62	268
05:00 PM	15	22	2	39	7	29	6	42	5	11	5	21	1	13	9	23	125
05:15 PM	8	24	5	37	9	28	2	39	3	13	6	22	3	10	14	27	125
05:30 PM	17	27	3	47	12	29	1	42	3	9	8	20	1	14	16	31	140
05:45 PM	7	19	1	27	9	22	7	38	0	10	7	17	5	6	12	23	105
Total	47	92	11	150	37	108	16	161	11	43	26	80	10	43	51	104	495
Grand Total	67	144	17	228	50	158	29	237	18	67	47	132	19	73	74	166	763
Apprch %	29.4	63.2	7.5		21.1	66.7	12.2		13.6	50.8	35.6		11.4	44	44.6		
Total %	8.8	18.9	2.2	29.9	6.6	20.7	3.8	31.1	2.4	8.8	6.2	17.3	2.5	9.6	9.7	21.8	
P. Veh.	65	143	16	224	50	158	29	237	17	64	47	128	19	73	73	165	754
% P. Veh.	97	99.3	94.1	98.2	100	100	100	100	94.4	95.5	100	97	100	100	98.6	99.4	98.8
Trucks	2	1	1	4	0	0	0	0	1	3	0	4	0	0	0	0	8
% Trucks	3	0.7	5.9	1.8	0	0	0	0	5.6	4.5	0	3	0	0	0	0	1
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4	0.6	0.1



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	County Road 34 E N/B				County Road 34 W S/B				County Road 27 W E/B				County Road 27 E W/B				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	12	23	4	39	6	28	8	42	6	11	11	28	4	15	12	31	140
05:00 PM	15	22	2	39	7	29	6	42	5	11	5	21	1	13	9	23	125
05:15 PM	8	24	5	37	9	28	2	39	3	13	6	22	3	10	14	27	125
05:30 PM	17	27	3	47	12	29	1	42	3	9	8	20	1	14	16	31	140
Total Volume	52	96	14	162	34	114	17	165	17	44	30	91	9	52	51	112	530
% App. Total	32.1	59.3	8.6		20.6	69.1	10.3		18.7	48.4	33		8	46.4	45.5		
PHF	.765	.889	.700	.862	.708	.983	.531	.982	.708	.846	.682	.813	.563	.867	.797	.903	.946

Appendix B

ITE TRIP GENERATION MANUAL – 10TH EDITION REFERENCES

Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 173

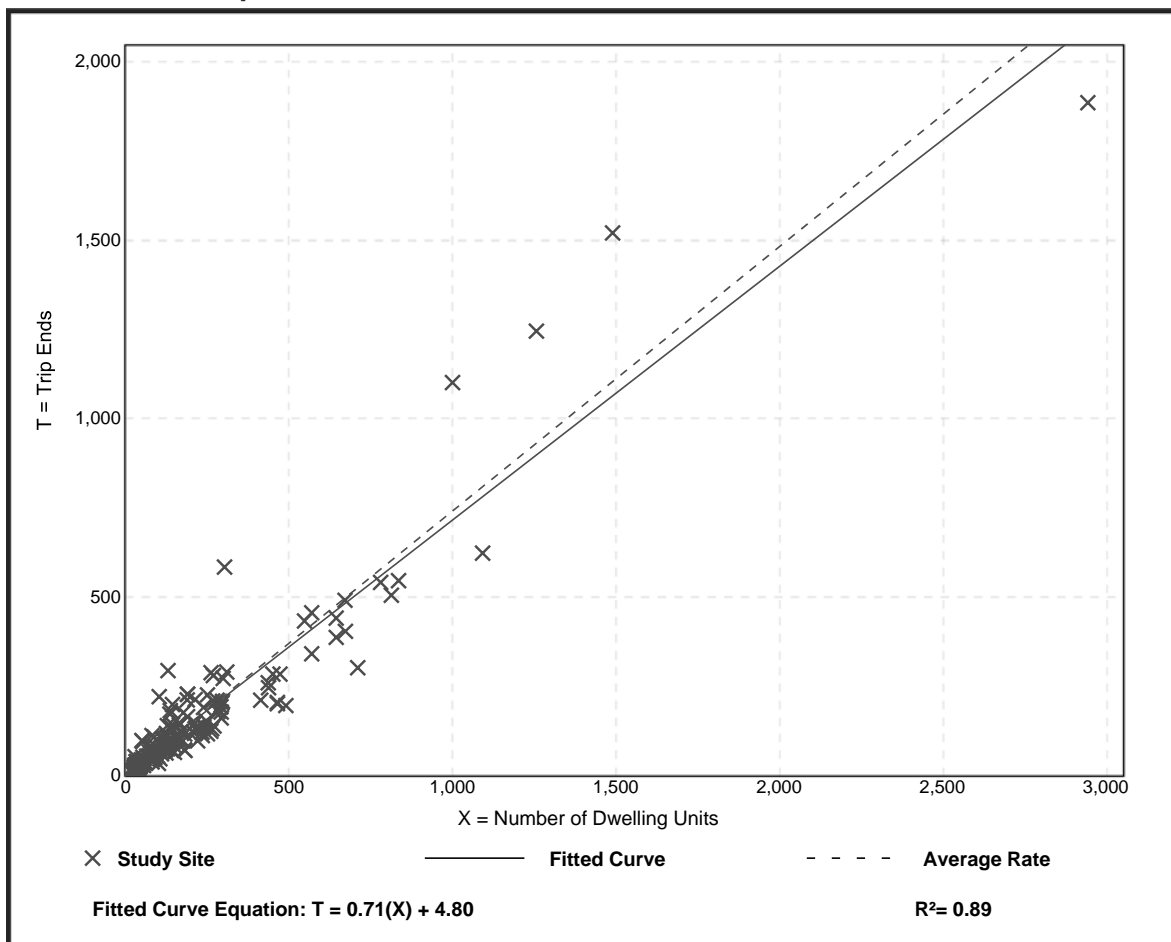
Avg. Num. of Dwelling Units: 219

Directional Distribution: 25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 190

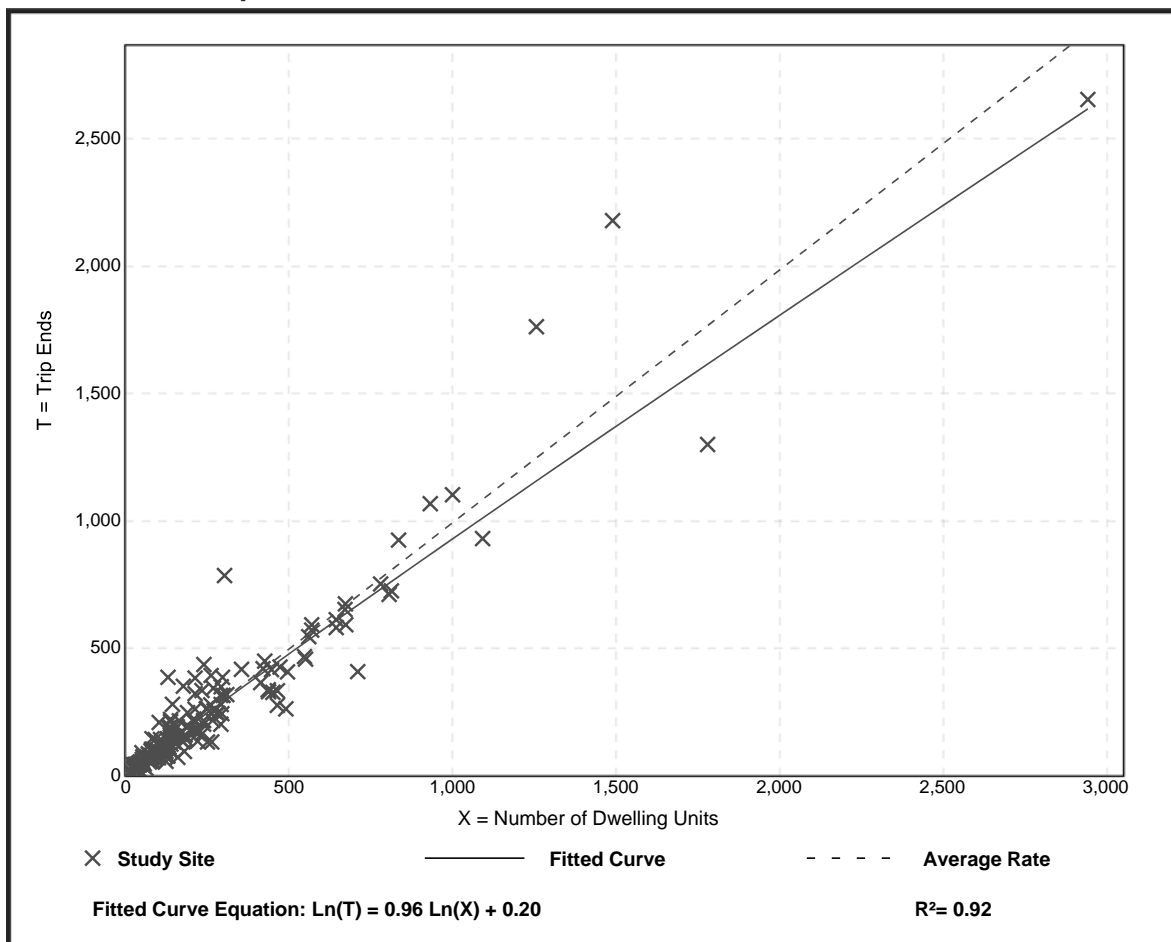
Avg. Num. of Dwelling Units: 242

Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



















Appendix C

DETAILED SYNCHRO RESULTS

County Road 27 at County Road 34
Existing Traffic - PM Peak

Reference: Figure 5A

















01/04/2018

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	29	158	50	17	144	67	47	67	18	74	73	19
Future Volume (vph)	29	158	50	17	144	67	47	67	18	74	73	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Frt		0.972			0.960			0.981			0.984	
Flt Protected		0.994			0.996			0.983			0.978	
Satd. Flow (prot)	0	1800	0	0	1781	0	0	1796	0	0	1793	0
Flt Permitted		0.994			0.996			0.983			0.978	
Satd. Flow (perm)	0	1800	0	0	1781	0	0	1796	0	0	1793	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.2			281.3			234.2			285.7	
Travel Time (s)		16.1			20.3			16.9			20.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	172	54	18	157	73	51	73	20	80	79	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	258	0	0	248	0	0	144	0	0	180	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	39.5%											
Analysis Period (min)	15											
	ICU Level of Service A											

County Road 27 at County Road 34
Existing + Site Generated Traffic - PM Peak

Reference: Figure 5B

















01/04/2018

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	31	176	50	18	154	67	47	71	20	74	75	20
Future Volume (vph)	31	176	50	18	154	67	47	71	20	74	75	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Frt		0.974			0.962			0.980			0.984	
Flt Protected		0.994			0.996			0.983			0.979	
Satd. Flow (prot)	0	1803	0	0	1785	0	0	1794	0	0	1794	0
Flt Permitted		0.994			0.996			0.983			0.979	
Satd. Flow (perm)	0	1803	0	0	1785	0	0	1794	0	0	1794	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.2			281.3			234.2			285.7	
Travel Time (s)		16.1			20.3			16.9			20.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	191	54	20	167	73	51	77	22	80	82	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	279	0	0	260	0	0	150	0	0	184	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	41.4%											
Analysis Period (min)	15											
ICU Level of Service A												

County Road 27 at County Road 34
Existing & 10% Increase + Site Generated Traffic - PM Peak

Reference: Figure 5C

01/04/2018

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	34	192	55	20	168	74	52	78	22	81	82	22
Future Volume (vph)	34	192	55	20	168	74	52	78	22	81	82	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. 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
Frt		0.974			0.962			0.980			0.984	
Flt Protected		0.994			0.996			0.983			0.979	
Satd. Flow (prot)	0	1803	0	0	1785	0	0	1794	0	0	1794	0
Flt Permitted		0.994			0.996			0.983			0.979	
Satd. Flow (perm)	0	1803	0	0	1785	0	0	1794	0	0	1794	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		223.2			281.3			234.2			285.7	
Travel Time (s)		16.1			20.3			16.9			20.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	209	60	22	183	80	57	85	24	88	89	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	306	0	0	285	0	0	166	0	0	201	0
Sign Control		Free			Free			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	44.5%											
Analysis Period (min)	15											
	ICU Level of Service A											

Appendix D

SIGHT LINE ANALYSIS CONSIDERATIONS

17-657: Armstrong Cottam Development

Design Intersection Sight Distance (TAC Geometric Design Guide for Canadian Roads)

Design Speed: Posted 50km/h

Table 9.9.3: Time Gap for Case B1, Left Turn from Stop

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	7.5
Single-unit truck	9.5
Combination truck (WB 19 and WB 20)	11.5
Longer truck	To be established by road authority

$$\text{Intersection Stopping Distance (ISD)} = 0.278 V_{\text{major}} t_g$$

Where:

ISD = intersection sight distance (m)
(length of the leg of sight triangle along the major road)
 V_{major} = design speed of the major road (km/h)
 t_g = time gap for minor road vehicle to enter the major road (s)

$$\text{ISD}_{\text{passenger car}} (\text{left turn from stop}) = 0.278 \times 50 \times 7.5 = \mathbf{104 \text{ m}}$$

Table 9.9.5: Time Gap for Case B2—Right Turn from Stop and Case B3—Crossing Maneuver

Design Vehicle	Time Gap (t_g)(s) at Design Speed of Major Road
Passenger car	6.5
Single-unit truck	8.5
Combination truck (WB 19 and WB 20)	10.5

$$\text{ISD}_{\text{passenger car}} (\text{right turn from stop}) = 0.278 \times 50 \times 6.5 = \mathbf{90 \text{ m}}$$