

Region of Peel

# Transportation Report

## Coleraine Drive Grade Separation EA

Project 16-4315

June 2017

B000738



## Transportation Report

### Coleraine Drive Grade Separation Schedule 'C' Class Environmental Assessment

Project n° 16-4315

Approved by :

\_\_\_\_\_  
Stephen Keen, P.Eng., M.Sc.

**CIMA+**  
3027 Harvester Road  
Suite 400  
Burlington (ON) L7N 3G7

June 2017

B0000738



## Table of contents

<b>1. Introduction .....</b>	<b>1</b>
1.1 Background.....	1
1.2 Purpose.....	1
1.3 Study Area.....	1
<b>2. Existing Conditions.....</b>	<b>4</b>
2.1 Road Network.....	4
2.2 Traffic Volumes.....	5
2.3 Intersection Operations .....	6
2.4 Collision History .....	9
2.5 Active Transportation Facilities.....	11
2.6 Access Management.....	11
2.7 Train Operations .....	12
2.8 Goods Movement.....	12
<b>3. Field Investigation Findings .....</b>	<b>14</b>
3.1 Railway Crossing .....	14
3.2 Intersection Geometry .....	14
3.3 Signs and Pavement Markings.....	15
3.4 Pavement Condition.....	16
3.5 Roadside Safety.....	16
3.6 Traffic Operations and Conflicts.....	18
3.7 Active Transportation Facilities.....	20
3.8 Access Management.....	23
<b>4. Proposed Grade Separation .....</b>	<b>25</b>
<b>5. Future Traffic Operations .....</b>	<b>27</b>
5.1 Background Traffic Growth (Without Grade Separation).....	27
5.2 Traffic Redirection (With Grade Separation) .....	29
5.3 Intersection Operations .....	31
<b>6. Transportation Improvements.....</b>	<b>35</b>

B000738

6.1	Intersection Operations .....	35
6.1.1	Intersection Capacity Improvements Without Grade Separation.....	35
6.1.2	Intersection Capacity Improvements Without Grade Separation.....	35
6.1.3	Roundabout Option.....	38
6.2	Traffic Safety .....	39
6.2.1	Safety Improvements Without Grade Separation.....	39
6.2.2	Safety Improvements With Grade Separation.....	41
6.2.3	Roundabout Option.....	41
6.3	Active Transportation .....	42
6.4	Access Management.....	44
<b>7.</b>	<b>Conclusions.....</b>	<b>46</b>

## Appendices

Appendix A: Turning Movement Counts

Appendix B: Synchro/SimTraffic/Arcady Outputs

## List of Tables

Table 1 – Turning Movement Counts.....	5
Table 2 – LOS Criteria for Signalized and Unsignalized Intersections .....	7
Table 3 – Existing Intersection Operations.....	8
Table 4 – Summary of Collision History .....	9
Table 5 – Coleraine Drive Trucks and Heavy Vehicles.....	13
Table 6 – Departure Sight Distances at #13351 and #13371 Coleraine Drive.....	24
Table 7 – Rail/Road Crossing Exposure Index.....	25
Table 8 – 2017 Existing and 2041 Projected Link Volumes.....	27
Table 9 – Proportion of Traffic between Harvest Moon Drive and Old Ellwood Drive .....	29
Table 10 – 2041 Intersection Operations Without Grade Separation .....	31
Table 11 – 2041 Intersection Operations With Grade Separation.....	33
Table 12 – Storage Length Improvements without Grade Separation.....	35
Table 13 – 2041 Intersection Operations With Grade Separation + Intersection Improvements .....	36
Table 14 – Storage Length Improvements with Grade Separation .....	38
Table 15 – 2041 Roundabout Operations at Coleraine Dr and King St/Harvest Moon Dr.....	38
Table 16 – Safety Improvements without Grade Separation.....	39
Table 17 – Safety Improvements with Grade Separation .....	41
Table 18 – Transportation Improvements with and without Grade Separation .....	47

B0000738

## List of Figures

Figure 1 – Study Area .....	2
Figure 2 – Existing Lane Configuration.....	5
Figure 3 – Existing Intersection Volumes.....	6
Figure 4 – Collision Diagram .....	10
Figure 5 – Existing Active Transportation Facilities .....	11
Figure 6 – Railway Signal/Gate Structure Obstructing Sight Line .....	14
Figure 7 – Left-Turn Lane Offsets.....	15
Figure 8 – Railway Crossing Warning Sign Too Close to Tracks.....	15
Figure 9 – School Crossing Ahead Warning Signs on Coleraine Drive.....	16
Figure 10 - Bodies of Water at the Bottom of Non-recoverable Slopes.....	17
Figure 11 - Guide Rail Installed Behind Barrier Curb.....	17
Figure 12 – Potential Conflict at Coleraine Drive and Ellwood Drive West.....	19
Figure 13 – Potential Conflict at Coleraine Drive and Old Ellwood Drive .....	20
Figure 14 - Right-turning Vehicles Driving Over Shoulder at Old Ellwood Drive.....	20
Figure 15 - Damaged Sidewalk .....	21
Figure 16 – Asphalt ‘Strips’ South of Old Ellwood Drive .....	21
Figure 17 – Sidewalk Termination with No Facilities to Cross Railway Tracks.....	22
Figure 18 – Narrow Sidewalk Between Guide Rail and Retaining Wall.....	22
Figure 19 – Pedestrian Pushbutton Not Fully Accessible .....	23
Figure 20 – Accesses with Potential Departure Sight Distance Restrictions .....	23
Figure 21 – 2041 Intersection Volumes (Without Grade Separation).....	28
Figure 22 – 2041 Intersection Volumes (With Grade Separation).....	30
Figure 23 – 2041 AM Southbound Queues During Train Crossing .....	32
Figure 24 – Roundabout Concept.....	39
Figure 25 – Long-term Regional Cycling Network in Bolton .....	42
Figure 26 – Bolton Transportation Master Plan: Active Transportation Strategy .....	43
Figure 27 – OTM Book 18 Desired Cycling Facility Pre-Selection Nomograph .....	44

B0000738

# 1. Introduction

## 1.1 Background

CIMA Canada Inc. (CIMA) was retained by the Region of Peel (the Region) to conduct a Municipal Class Environmental Assessment (MCEA) Study for the proposed grade separation of the rail tracks on Coleraine Drive, near Old Ellwood Drive. This project was initiated as a Schedule C project, following Phases 1 to 4 of the Class EA planning process.

## 1.2 Purpose

This Transportation and Traffic Study report reviews the existing and future conditions in the study area, in terms of traffic operations, traffic safety, active transportation facilities, and access management, both with and without the proposed grade separation.

The findings of this report will assist in the identification of problems and evaluation of opportunities for the environmental assessment. In addition, the report will assist in the development of alternative solutions. For this study, CIMA completed the following main tasks:

- + Data collection;
- + Traffic operational analysis;
- + Collision analysis;
- + Field investigation; and
- + Study findings and recommendations.

## 1.3 Study Area

The main study area for the proposed grade separation is illustrated in **Figure 1** and extends along Coleraine Drive, between King Street West/Harvest Moon Drive and Holland Drive. The study area has been extended for the purposes of the traffic operational analysis because of the expected redirection of trips resulting from the proposed grade separation (resulting from eliminating the intersections of Coleraine Drive with Ellwood Drive and Old Ellwood Drive). It includes the intersections of Station Road with King Street West and Old Ellwood Drive. The railway crossing which is subject of the proposed grade separation is located immediately south of the intersection of Coleraine Drive and Old Ellwood Drive.

Figure 1 – Study Area



Coleraine Drive plays a major role for vehicular traffic commuting from the northern section of Bolton through Highway 50 to Brampton and Mississauga. The land use along the study area of Coleraine Drive is mainly residential north of the railway, the majority without direct access to the road. South of the railway, the land use is predominantly industrial, with two signalized intersections at Manchester Court and Holland Drive, which provide access to large industrial developments, and several minor accesses (unsignalized).

The study area includes the following intersections:

+ Main study area:

- Coleraine Drive and King Street West/Harvest Moon Drive (4-leg, signalized);
- Coleraine Drive and Ellwood Drive West (3-leg, stop control on Ellwood Drive West);
- Coleraine Drive and Old Ellwood Drive (3-leg, signalized);
- Coleraine Drive and Manchester Court (4-leg, signalized access);
- Coleraine Drive and Holland Drive (4-leg, signalized with access on west leg);

B0000738



- + Extended study area:
  - King Street West and Station Road (4-leg, signalized); and
  - Old Ellwood Drive and Station Road (3-leg, all-way stop control).

B000738

## 2. Existing Conditions

### 2.1 Road Network

The roads within the study area under Region of Peel's jurisdiction include Coleraine Drive and King Street West. The remaining roads are under Town of Caledon's jurisdiction. The following provides a summary of the roads within the study area, and the role they play in the Regional and Municipal road network.

**Coleraine Drive** is an arterial road aligned in the north-south direction with a 4-lane cross section plus a wide "buffer", which is occasionally used as a two-way left-turn lane to provide access to industrial developments, or as exclusive left-turn lanes at intersections. Land use along Coleraine Drive is mainly residential north of the railway; and predominantly industrial south of the railway. The posted speed limit on Coleraine Drive is 60 km/h for most of its section within the study area, and 70 km/h south of a point approximately 100 metres south of Manchester Court.

**King Street West** is an arterial road aligned in the east-west direction with a 2-lane urban cross section. Land use along King Street varies from commercial downtown use on the east end to residential and rural as it connects to Coleraine Drive. The posted speed limit on King Street is 60 km/h at Coleraine Drive and reduces to 50 km/h approximately 100 m west of Station Road.

**Harvest Moon Drive** is a residential collector road with a 2-lane urban cross section. Land use along Harvest Moon Drive is residential. The posted speed limit is 40 km/h.

**Old Ellwood Drive** is a collector road with a 2-lane rural cross section at its west end. There are no developments along Old Ellwood Drive within the study area, however it serves as a connection between residential development east of the study area and Coleraine Drive. Old Ellwood Drive runs parallel to the railway and has a posted speed limit of 40 km/h.

**Ellwood Drive West** is a local road with a 2-lane urban cross section. Land use along Old Ellwood Drive is residential. The posted speed limit is 40 km/h.

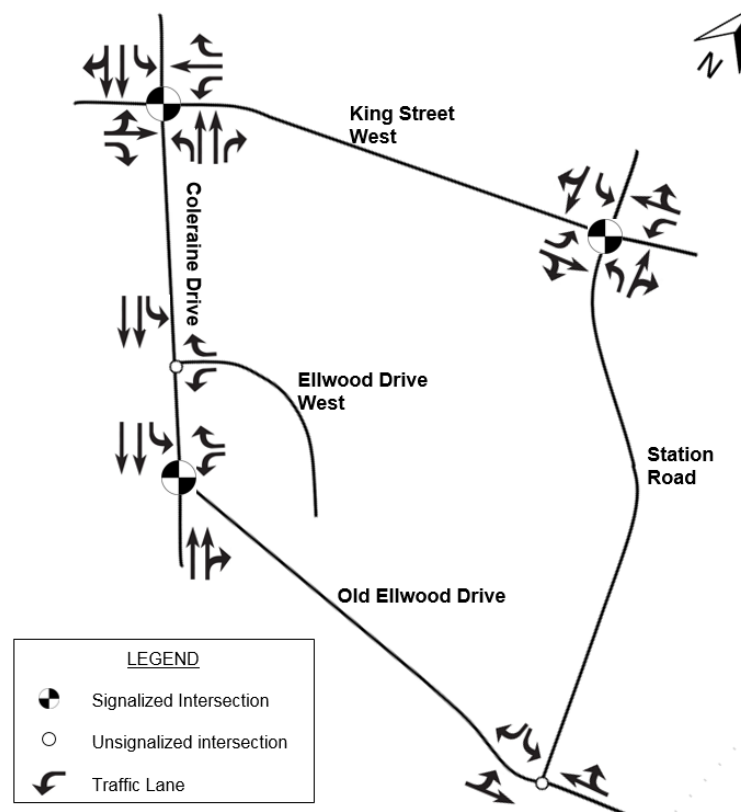
**Manchester Court** is a local road with a 2-lane urban cross section. Manchester Court provides access to the industrial lands west of Coleraine Drive and does not connect to any other roads except for Coleraine Drive. There is no posted speed limit (therefore it is assumed to be 50 km/h per Highway Traffic Act).

**Holland Drive** is a collector road with a 2-lane urban cross section. Land use along Holland Drive is commercial/industrial. There is no posted speed limit (therefore it is assumed to be 50 km/h per Highway Traffic Act).

**Station Road** is a collector road with a 2-lane urban cross section. Land use along Station Road is residential, however there is no direct access to properties along the road. Station Road extends between Old Ellwood Drive and King Street West, and provides access to the residential areas on the north and south sides of King Street West. North of King Street West the road is Deer Valley Drive. The posted speed limit is 40 km/h.

**Figure 2** illustrates the existing lane configuration at the intersections in the study area for which traffic operational analysis was conducted.<sup>1</sup>

**Figure 2 – Existing Lane Configuration**



## 2.2 Traffic Volumes

CIMA obtained the following Turning Movement Counts (TMC) from Pyramid Traffic Inc. and Trans-Plan Inc. to be used as input for the operational analysis. The TMCs provided are listed in **Table 1**. The TMCs, which are provided in Appendix A, indicate that the AM Peak Hour occurs between 7:15 and 8:15, and the PM Peak Hour occurs between 16:45 and 17:45.

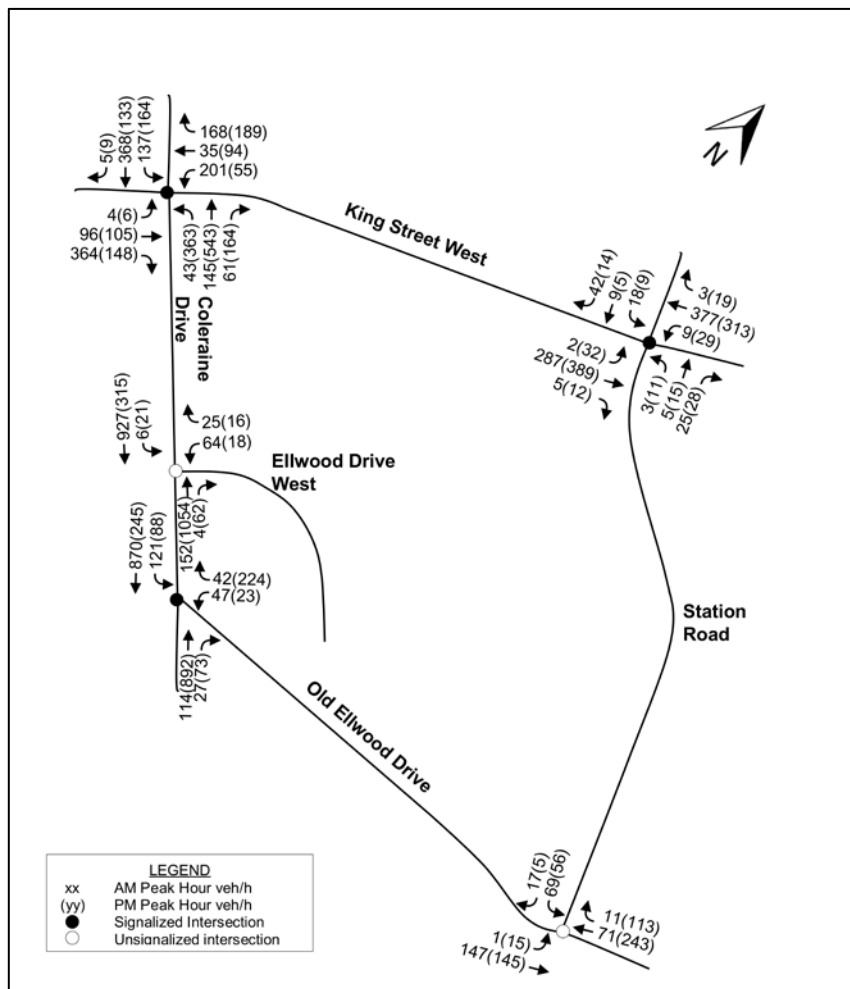
**Table 1 – Turning Movement Counts**

Intersection	Date	Source
Coleraine Drive at Ellwood Drive West	Feb. 02, 2017	Pyramid Traffic Inc.
King Street West at Deer Valley Drive/Station Road	Feb. 02, 2017	Pyramid Traffic Inc.
Coleraine Drive at Old Ellwood Drive	Feb. 02, 2017	Pyramid Traffic Inc.
Station Road at Old Ellwood Drive	Feb. 02, 2017	Pyramid Traffic Inc.
King Street/Harvest Moon Drive at Coleraine Drive	Feb. 10, 2016	Trans-Plan Inc.

<sup>1</sup> The intersections of Coleraine Drive with Manchester Court and Holland Drive are not expected to be operationally affected. Any traffic redirection resulting from the proposed grade separation is expected to occur north of the railway.

The differences in trips between upstream and downstream intersections along Coleraine Drive were reviewed to determine the need to balance volumes between each pair of intersections, since the counts at the King Street and Coleraine Drive intersection were conducted on a different date than the remaining intersections. Station Road intersects with local streets leading to residential areas (Plummer Road and Wakely Boulevard/Rolling Hills Lane), which were recognized as potential origins and destinations that can contribute to volume differences between the intersections at King Street West and at Old Ellwood Drive. Volume differences along Station Road were under 74 vehicles and were considered reasonable based on the presence of these local streets. Minor volume balancing was done by adjusting through volumes along Coleraine Drive and King Street West. The balanced turning movements for the network are shown in **Figure 3**.

**Figure 3 – Existing Intersection Volumes**



### 2.3 Intersection Operations

Intersection capacity analysis was undertaken using procedures described in the Highway Capacity Manual (HCM). The analysis primarily focuses on performance measures such as level-of-service (LOS), volume to capacity (v/c) ratio, and 95<sup>th</sup> percentile queues.

B000738

LOS is a qualitative measure of operational performance and is based on control delay. The LOS criteria for signalized and unsignalized intersections are shown in **Table 2**.

**Table 2 – LOS Criteria for Signalized and Unsignalized Intersections**

LOS	Control Delay (seconds/vehicle)		Traffic Flow Characteristics
	Signalized Intersections	Unsignalized Intersections	
A	0 – 10	0 – 10	Very Good
B	> 10 – 20	>10 – 15	Good
C	> 20 – 35	>15 – 25	Typically preferred planning objective
D	> 35 – 55	>25 – 35	Typically acceptable
E	> 55 – 80	>35 – 50	Undesirable; potentially unstable traffic flow
F	> 80	>50	Failing movements may impede traffic flow

The v/c ratio is the ratio between traffic volumes and the capacity of an intersection movement. A v/c ratio greater than 1.0 indicates that the movement is operating over capacity.

The 95<sup>th</sup> Percentile Queue is the queue length that has only a 5 percent probability of being exceeded during the analysis period. It is industry practice and accepted methodology to use the 95<sup>th</sup> percentile queue length for design and operational analysis purposes.

Additionally, the review of intersection operations followed the Region of Peel’s Traffic Impact Studies Terms of Reference,<sup>2</sup> which indicates that the analysis must identify intersections where:

- + v/c ratios for overall intersection operations, through movements or shared through/turning movements are 0.90 or above;
- + v/c ratios for exclusive movements are above 1.00; and
- + 95<sup>th</sup> percentile queue lengths for individual movements exceed available lane storage.

Existing intersection operations are summarized in **Table 3**. The results indicate that all intersections and individual movements are operating well under capacity (v/c ratio not higher than 0.72) and with acceptable level of service (LOS C or better). Movements where 95<sup>th</sup> percentile queues exceed available storage include the eastbound right-turn at Harvest Moon Drive and Coleraine Drive, and the southbound left-turn at Coleraine Drive and Old Ellwood Drive.

Detailed Synchro/SimTraffic outputs are provided in Appendix B for further reference.

<sup>2</sup> <https://www.peelregion.ca/pw/transportation/business/impact-study.htm>



**Table 3 – Existing Intersection Operations**

Direction	Mov.	Storage Length	AM Peak Hour				PM Peak Hour			
			v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>Coleraine Drive and King St/Harvest Moon Drive (Signalized)</b>										
EB	L/T	-	0.22	25.9	C	30	0.29	31.4	C	34
	R	20	0.24	26.4	C	46	0.13	29.1	C	19
WB	L	57	0.41	19.1	B	44	0.15	23.3	C	20
	T	-	0.07	16.7	B	10	0.17	24.3	C	24
	R	60	0.14	17.5	B	N/R	0.14	24.0	C	N/R
NB	L	65+	0.14	22.5	C	23	0.58	18.0	B	64
	T	-	0.14	25.5	C	31	0.46	25.6	C	74
	R	35	0.05	24.6	C	17	0.18	22.5	C	24
SB	L	70	0.33	21.7	C	37	0.49	21.9	C	39
	T/R	0	0.34	26.7	C	45	0.17	27.5	C	29
<b>Overall</b>		-	<b>0.40</b>	<b>23.4</b>	<b>C</b>	-	<b>0.47</b>	<b>24.2</b>	<b>C</b>	-
<b>Coleraine Drive and Old Ellwood Drive (Signalized)</b>										
WB	L/R	-	0.35	28.0	C	27	0.72	31.1	C	33
NB	T/R	-	0.11	4.1	A	30	0.58	10.4	B	108
SB	L	20	0.18	3.9	A	40	0.48	14.0	B	25
	T	-	0.43	4.8	A	100	0.13	5.8	A	25
<b>Overall</b>		-	<b>0.44</b>	<b>66.8</b>	<b>A</b>	-	<b>0.62</b>	<b>13.7</b>	<b>B</b>	-
<b>Coleraine Drive and Ellwood Drive West (Unsignalized)</b>										
WB	L/R	-	0.22	12.8	B	9	0.10	13.8	B	15
NB	T/R	-	0.09	0	A	-	0.45	0	A	-
SB	L	60	0.01	8.2	A	9	0.04	10.6	B	11
	T	-	0.31	0	A	78	0.10	0	A	-
<b>Overall</b>		-	<b>0.37</b>	<b>1.2</b>	<b>A</b>	-	<b>0.41</b>	<b>0.6</b>	<b>A</b>	-
<b>Station Road and King Street West (Signalized)</b>										
EB	L	23	0.01	3.4	A	2	0.05	2.7	A	10
	T/R	-	0.29	4.8	A	27	0.31	3.8	A	38
WB	L	75	0.03	3.5	A	6	0.07	2.8	A	12
	T/R	-	0.37	5.3	A	34	0.27	3.6	A	30
NB	L	28	0.07	28.4	C	5	0.17	34.1	C	9
	T/R	-	0.08	28.4	C	13	0.16	33.9	C	16
SB	L	30	0.16	29.0	C	11	0.14	33.9	C	9
	T/R	-	0.22	29.3	C	16	0.10	33.5	C	11
<b>Overall</b>		-	<b>0.34</b>	<b>10.8</b>	<b>B</b>	-	<b>0.30</b>	<b>7.5</b>	<b>A</b>	-

B0000738

Direction	Mov.	Storage Length	AM Peak Hour				PM Peak Hour			
			v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>Old Ellwood Drive at Station Road</b>										
<b>EB</b>	L/T	-	0.22	8.6	A	19	0.27	9.3	A	18
<b>WB</b>	T/R	-	0.14	8.0	A	15	0.47	11.0	B	25
<b>SB</b>	L/R	-	0.16	8.5	A	15	0.12	9.1	A	15
<b>Overall</b>		-	<b>0.20</b>	<b>8.4</b>	<b>A</b>	-	<b>0.30</b>	<b>10.2</b>	<b>B</b>	-

*Notes:*

The northbound left-turn lane on Coleraine and King continues as a two-way left-turn lane

NR: Not reported (channelized right-turn)

## 2.4 Collision History

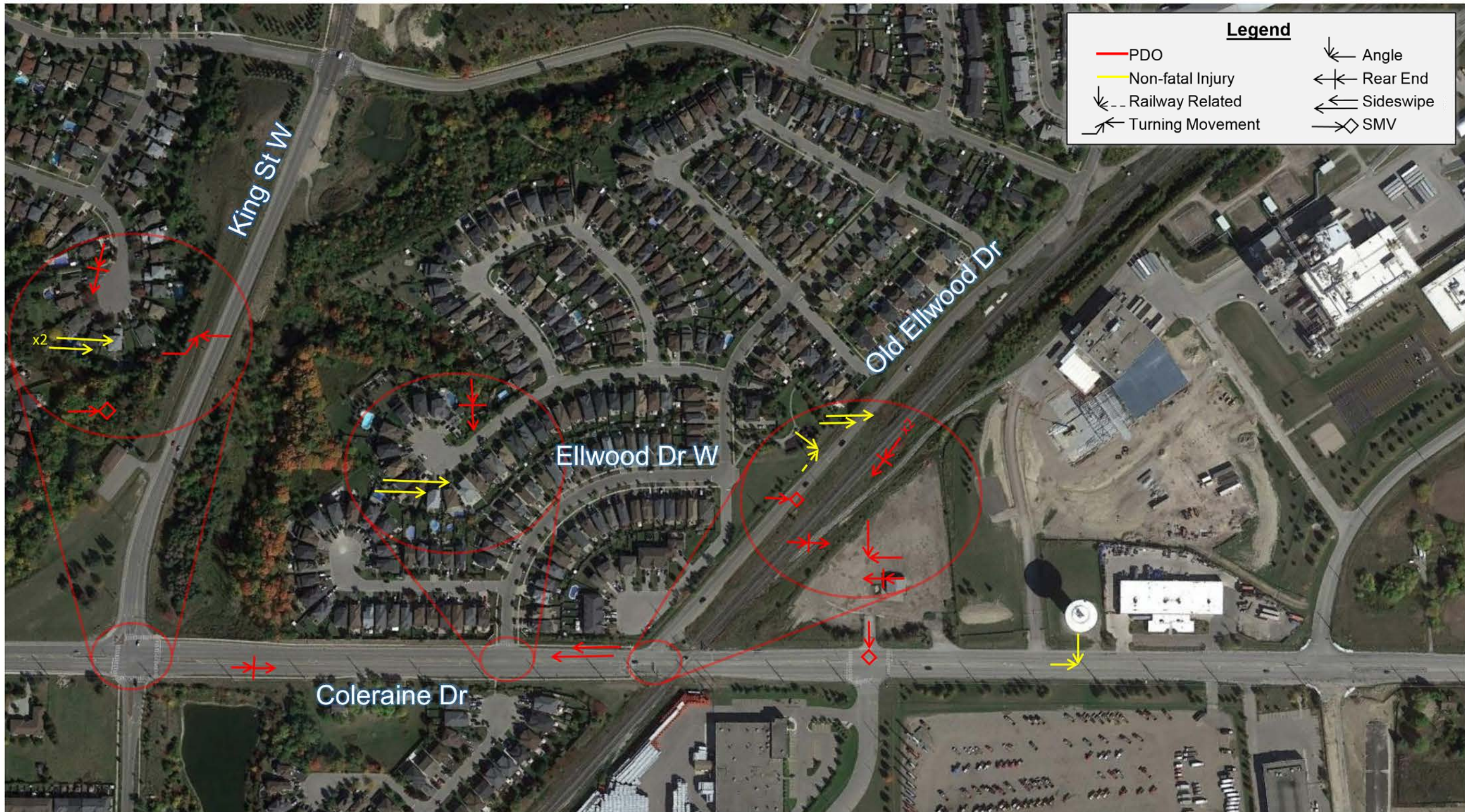
Historical collision data were provided by the Region for the intersections and road segments along Coleraine Drive within the study area, and were reviewed to gain an understanding of any collision patterns and potential contributing factors. A total of 19 collisions were reported in the main study area between 2012 and 2016.<sup>3</sup> **Table 4** summarizes collisions by location and severity, and **Figure 4** illustrates each individual collision. No major collision patterns were identified.

**Table 4 – Summary of Collision History**

Intersection	Severity	Impact Type	Notes
Coleraine Drive and King Street/Harvest Moon Drive	3 P.D.O. 2 Injury	2 Sideswipe 1 Turning Movement 1 Rear end 1 Single Motor Vehicle	4 out of the 5 collisions involved a southbound vehicle
Coleraine Drive and Ellwood Drive W	1 P.D.O. 1 Injury	1 Rear end 1 Sideswipe	No patterns identified
Coleraine Drive and Old Ellwood Drive / CPR Crossing	5 P.D.O. 3 Injury	4 Rear end 2 Angle 1 Single Motor Vehicle 1 Sideswipe	1 angle collision involving a train (automobile driver disobeyed traffic control) No patterns identified
Coleraine Drive and Manchester Court	1 P.D.O.	1 Single Motor Vehicle	No patterns identified
Coleraine Drive and Holland Drive	No collisions reported		
Segment	Severity	Impact Type	Impact Type
King Street/Harvest Moon Drive to Ellwood Drive W	1 P.D.O.	1 Rear end	None identified
Ellwood Drive W to Old Ellwood Drive	1 P.D.O.	1 Sideswipe	
Old Ellwood Drive to Manchester Court	No collisions reported		
Manchester Court to Holland Drive	1 Injury	1 Angle	

<sup>3</sup> The Region provided collision data between 2010 and 2016. The typical study period used in collision analyses is 3 to 5 years, since longer periods may not fully represent current traffic conditions. In fact, the intersection of Coleraine Drive & King Street West was recently reconstructed and relocated. For this reason, the data was filtered to include only the 5-year period between 2012 and 2016.

Figure 4 – Collision Diagram



BC000738

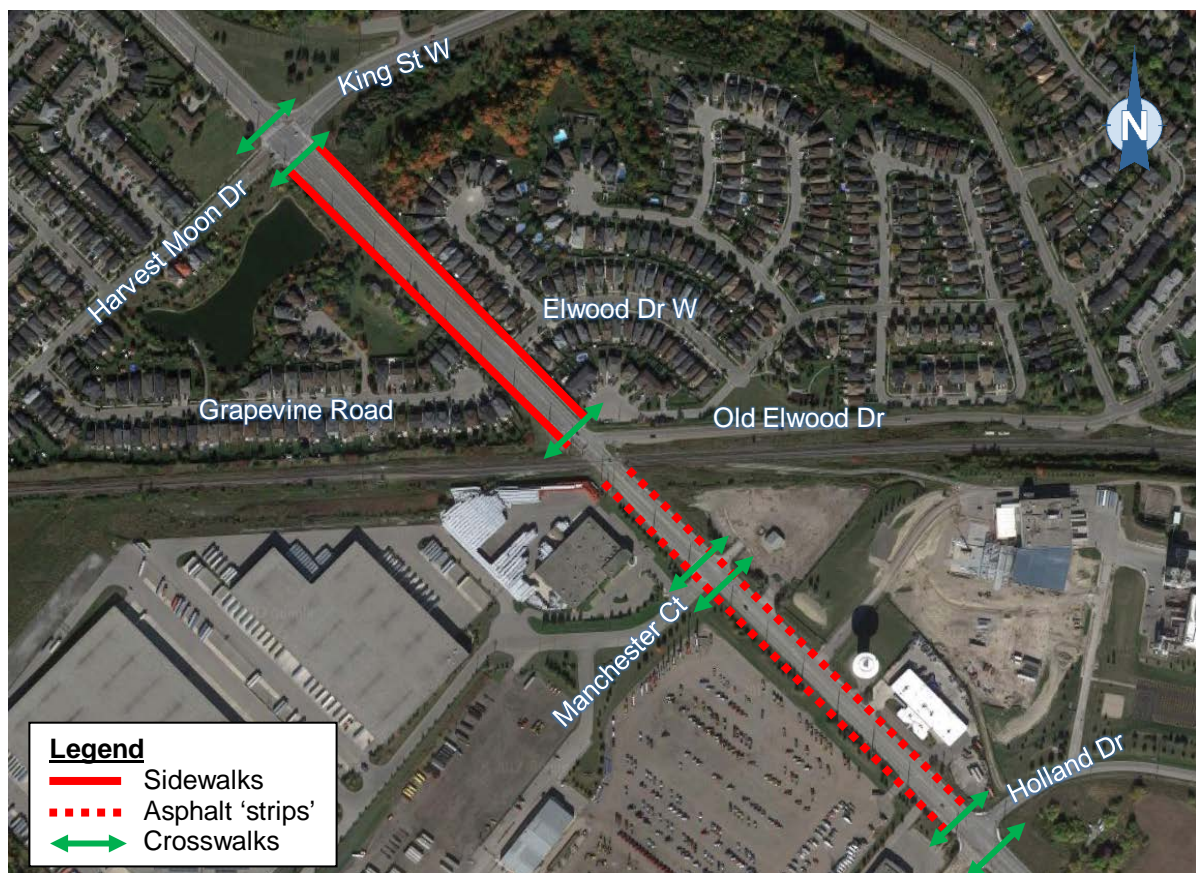




## 2.5 Active Transportation Facilities

Currently, no bicycle facilities are provided along Coleraine Drive within the study area. Sidewalks are provided on both sides of the road, extending between King Street/Harvest Moon Drive and Old Ellwood Drive. The sidewalk does not continue south of Old Ellwood Drive (and of the railway tracks), although raised asphalt 'splash strips' adjacent to the curb extend towards the south end of the study area which could potentially be used by pedestrians (further details are provided in Section 3.7). Opportunities to cross Coleraine Drive are provided at each signalized intersection (**Figure 5**), however there are no appropriate pedestrian crossing facilities to cross the railway from the north side to the south side. A pedestrian access is provided between the west side of Coleraine Drive and Grapevine Road (opposite to Ellwood Drive West).

**Figure 5 – Existing Active Transportation Facilities**



## 2.6 Access Management

The amount and nature of accesses on Coleraine Drive differs considerably between the north side and the south side of the railway tracks. On the north side, there are only three residential driveways on the west side of the road, all of which will potentially need to be closed when the grade separation is implemented. On the south side of the railway tracks, there are approximately 8 industrial driveways on both sides of the road. It is expected that 3 of these accesses will need to be closed and relocated.

B0000738

There are two major accesses (signalized intersections) south of the rail crossing, at Manchester Court and at Holland Drive, providing access to large industrial developments. A TMC conducted in 2016 shows 70 vehicles entering and 21 vehicles exiting the Manchester Court on the west side of Coleraine Drive in the AM peak hour, and 13 vehicles entering and 62 vehicles exiting in the PM peak hour. A TMC conducted in 2015 shows no volumes entering or exiting Holland Drive, however this access appears to have been recently built (based on Google Street View imagery). A high-level trip generation estimate results in approximately 106 inbound and 48 outbound vehicles in the AM peak hour, and 52 inbound and 116 outbound vehicles in the PM peak hour.<sup>4</sup>

Section 3.8 provides further discussion relating to access management, including sight distance assessments for driveways not expected to be closed/relocated.

## 2.7 Train Operations

According to the Transport Canada Grade Crossings Inventory,<sup>5</sup> the Coleraine Drive at-grade rail crossing serves 18 freight trains per day and no passenger trains. This means that the grade crossing signals and gates are activated, on average, once every 1 hour and 20 minutes. Although trains do not have a fixed schedule, it is reasonable to assume that, on most occasions, no more than one or two trains use the crossing during peak hours, meaning that their impacts on traffic operations are not expected to be sustained over long periods. This was confirmed during the field investigation, when only one train was observed during the AM peak hour, and another one during the PM peak hour.

The maximum train speed indicated in the Transport Canada Inventory is 55 mph (88 km/h). For the purposes of the traffic operational analysis, a train speed of 50 km/h and a train length of 2.5 km were assumed at the crossing in order to estimate signal timing parameters.

In the future, there are plans by Metrolinx to extend electrified GO Train service to a new Bolton station, to be located to the north of King Street. This will increase train frequency considerably.

## 2.8 Goods Movement

Coleraine Drive is part of an important Goods Movement corridor, providing a by-pass route to Highway 50, preventing heavy truck traffic from entering Downtown Bolton. Coleraine Drive also provides access to several industrial destination, including a Canadian Tire Distribution Centre. Based on recent intersection counts, truck and heavy vehicle traffic ranges between 10 and 15% of volumes, as summarized in **Table 5**.

<sup>4</sup> Based on ITE Trip Generation Manual (9<sup>th</sup> Edition) average rates for Land Use Code 152 (High-Cube Warehouse Distribution Centre) and considering the approximate area of 1,400,000 ft<sup>2</sup> of the Canadian Tire distribution centre located at #13226 Coleraine Drive.

<sup>5</sup> <http://open.canada.ca/data/en/dataset/d0f54727-6c0b-4e5a-aa04-ea1463cf9f4c>

**Table 5 – Coleraine Drive Trucks and Heavy Vehicles**

TMC	Date	Source	Count Period	Truck Volume	Truck %
King Street/Harvest Moon Drive at Coleraine Drive	Feb. 10, 2016	Trans-Plan Inc.	9.5 hours	NB: 332 SB: 305	NB: 14% SB: 13%
Coleraine Drive at Ellwood Drive West	Feb. 02, 2017	Pyramid Traffic Inc.	9.5 hours	NB: 355 SB: 330	NB: 11% SB: 10%
Coleraine Drive at Holland Drive	May 13, 2015	Trans-Plan Inc.	6 hours	NB: 333 SB: 385	NB: 15% SB: 13%

If the percentages in Table 5 are extrapolated to Average Annual Daily Traffic (AADT), the estimated truck and heavy vehicle volume ranges between 1,304 and 1,956 (both directions combined).<sup>6</sup>

It should be noted that this report does not include a detailed review of goods movement. This subject will be discussed in further detail in the Transportation Demand Management White Paper.

B000738

<sup>6</sup> Based on the data available in the Region of Peel Data Centre website, the AADT on Coleraine Drive is 13,038 for the year 2015. Station 15008000 COLERAINE DRIVE 0.15 KM SOUTH OF HARVEST MOON. Data retrieved from <http://opendata.peelregion.ca/data-categories/transportation/traffic-count-stations.aspx>.

### 3. Field Investigation Findings

CIMA+ undertook a field investigation on Thursday, March 9, 2017 to identify any potential safety and operational issues in the study area. During the field investigation, the study team observed the conformance, consistency and conditions of site geometrics, traffic control devices, physical characteristics and roadside safety and road user interface with the study area. The following sections summarize our field investigation findings.

#### 3.1 Railway Crossing

The railway crossing gate and signal structure was observed to partially obstruct visibility for westbound drivers on Old Ellwood Drive (looking south), as illustrated in **Figure 6**. Although its intersection with Coleraine Drive is signalized, right-turn on red is permitted, and this could lead to drivers entering the major road with insufficient gaps, forcing northbound drivers to brake or change lanes, which could contribute to rear end or sideswipe collisions.

**Figure 6 – Railway Signal/Gate Structure Obstructing Sight Line**



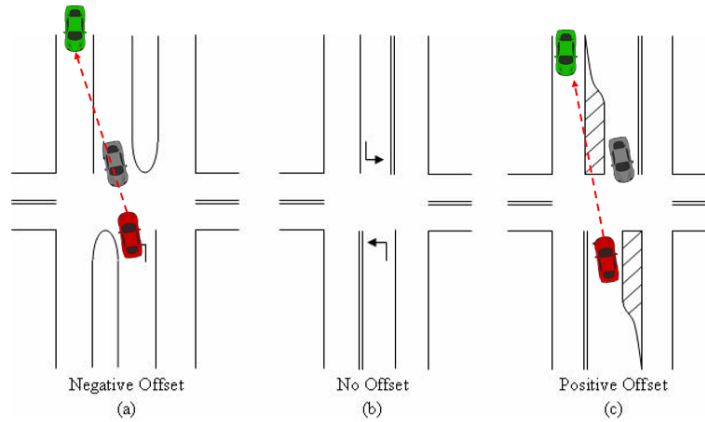
Additionally, the surface at the railway crossing was noticed to be uneven, which could contribute to loss of control if drivers cross at higher speeds.

#### 3.2 Intersection Geometry

The left-turn lanes at the intersection of Coleraine Drive with King Street/Harvest Moon Drive present negative offsets, which can create visibility restrictions to drivers attempting to turn left during the permissive phase when drivers in the opposite direction are attempting to do the same (**Figure 7**). Introducing positive offsets can improve visibility and reduce turning movement collisions by 38% (although these collisions were not found to be a concern in the study area, the grade separation project provides an opportunity to improve the design of the intersection).

B000738

**Figure 7 – Left-Turn Lane Offsets**



### 3.3 Signs and Pavement Markings

The RAILWAY CROSSING AHEAD (Wc-4) signs are installed 31 and 60 metres in advance of the stop bars in the northbound and southbound directions, respectively (**Figure 8**). According to OTM Book 6, Wc-4 signs are classified as “Condition B – Potential/Actual Stop Condition”. As such, the minimum advance placement should be 225 metres (considering posted speed of 60 km/h and stopping condition).

**Figure 8 – Railway Crossing Warning Sign Too Close to Tracks**



Coleraine Drive, in the northbound and southbound directions, presents SCHOOL CROSSING AHEAD (Wc-2A) warning signs on approach to King Street West/Harvest Moon Drive. OTM Book 6 states that “*signed school crossings must not be located at pedestrian crossovers, at intersections with traffic signals, or at intersections with pedestrian signals*”.

B000738

**Figure 9 – School Crossing Ahead Warning Signs on Coleraine Drive**



The speed limit along King Street West changes from 60 km/h to 50 km/h approximately 350 metres east of Coleraine Drive. The speed limit on Harvest Moon Drive is 40 km/h. The *Canadian Guidelines for Establishing Posted Speed Limits*<sup>7</sup> recommends that speed zone lengths of less than 500 metres should be avoided.

Pavement markings were observed to be in good condition through most of the study area during the field investigation. Only at the intersection of Coleraine Drive and Holland Drive some pavement markings were relatively faded.

### 3.4 Pavement Condition

Pavement was observed to be in good condition north of the railway tracks, and in fair condition south thereof. Pavement condition outside of the at-grade railway crossing area did not raise any concerns.

### 3.5 Roadside Safety

Two bodies of water were identified within the study area, located at the bottom of non-recoverable slopes. One is located at the southwest quadrant of Coleraine Drive and Harvest Moon Drive, and the other is located at the southwest quadrant of the intersection of King Street West and Station Road, as illustrated in **Figure 10**. While they are currently located outside of the clear zone based on current posted speed limits (and assumed design speeds of 20 km/h over posted speed) and the presence of barrier curb, potential widening to accommodate increased traffic may place them within the clear zone in the future. If this occurs, the design should consider clear zone requirements resulting from potential changes in traffic volumes and/or design speeds (which influence the clear zone requirements) and, if necessary, include measures to create a recoverable area or shield any potential roadside hazards.

<sup>7</sup> Transportation Association of Canada, 2009.

**Figure 10 - Bodies of Water at the Bottom of Non-recoverable Slopes**



The guide rail on the east side of Coleraine Drive, immediately south of King Street West, is installed approximately 1.1 metres behind the barrier curb (Figure 11). NCHRP Report 537 - *Recommended Guidelines for Curb and Curb-Barrier Installations* recommends that, depending on the operating speed, guide rails be installed at certain minimum offsets behind the barrier curb, as follows:

- + 60 to 70 km/h – Offset of 0 m or not closer than 2.5 m;
- + 71 to 85 km/h – Offset of 0 m or not closer than 4.0 m; and
- + Greater than 85 km/h – Guide rails should not be located behind a curb.

**Figure 11 - Guide Rail Installed Behind Barrier Curb**



According to the recommended guidelines, the vehicle bumper may rise above the critical height of the guide rail for many road departure angles, making vaulting the barrier likely. The recommended offsets allow the vehicle suspension to return to its pre-departure state.

Although speed studies were not provided, it is not unreasonable to expect speeds over the posted speed limit of 60 km/h (assuming that the current design speed of the road is higher than the speed

B000738

limit). If that is the case, the guide rail may pose a vaulting hazard. It should be noted that this guide rail is used to shield an embankment approximately 10 metres high, therefore, should a vehicle vault the guide rail, it could fall into the embankment, which could cause severe injuries to vehicle occupants.

The energy attenuator at the approach end of the guide rail is also installed behind the barrier curb. The approach to an energy attenuator should be as smooth as possible so that errant vehicles strike it at the appropriate height/angle for which the end treatment is designed.

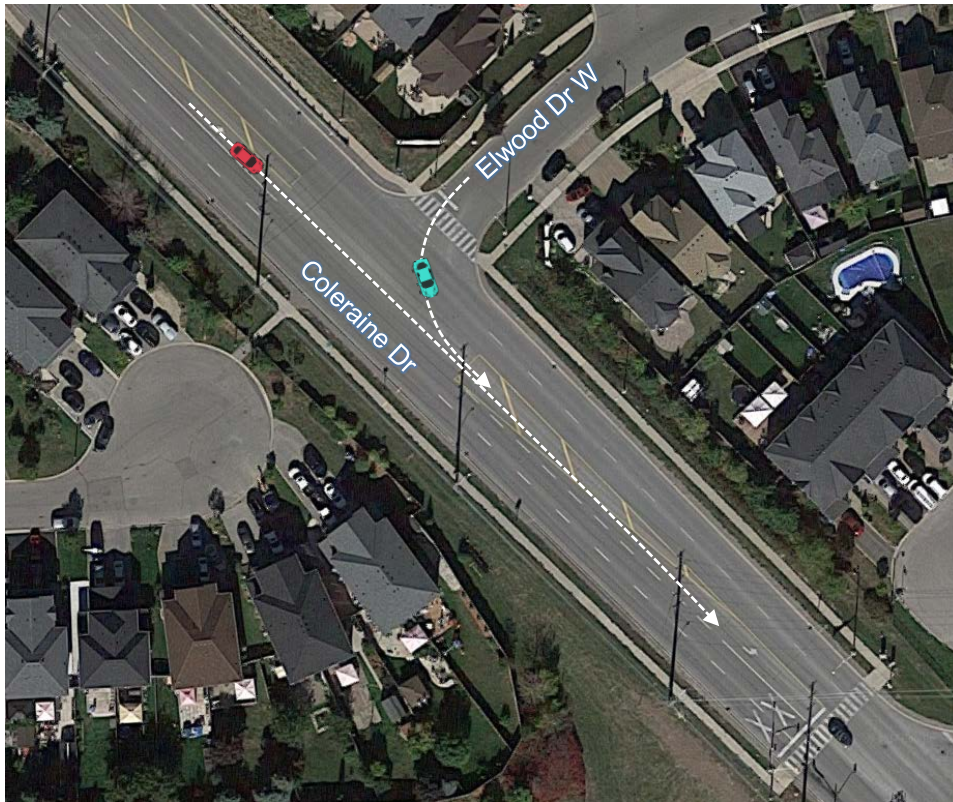
### 3.6 Traffic Operations and Conflicts

Signalized intersections in the study area were observed to operate well during both the AM and PM peak hours. No excessive queues were noted, and all movements at all intersections would clear within 1 signal cycle. The only source of longer queues was the railway crossing. When the gates closed (1 occasion observed during the AM peak hour and 1 during the PM peak hour), northbound and southbound queues on Coleraine Drive extended beyond the typical length, however upstream intersections were not affected. Once the gates opened, all queued vehicles were able to clear the crossing within a reasonable time.

Some conflicts were observed in the study area which could represent safety concerns. During the AM peak hour, one vehicle was observed turning left from Ellwood Drive West onto Coleraine Drive southbound and positioning on the hatched area to wait for an opportunity to merge onto southbound traffic. Other vehicles were observed driving over the same hatched area to align with the southbound left-turn lane at Coleraine Drive and Old Ellwood Drive, as illustrated in **Figure 12**. If these two manoeuvres occur simultaneously, they may contribute to angle, sideswipe, or rear end collisions.



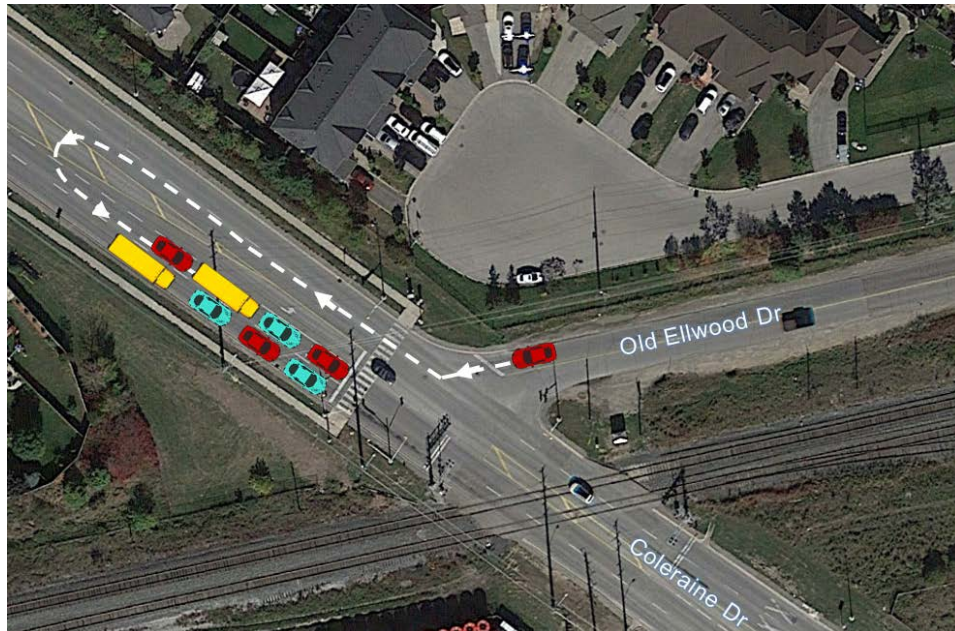
**Figure 12 – Potential Conflict at Coleraine Drive and Ellwood Drive West**



During the PM peak hour, when the railway gate was closed and drivers had to wait for a long time, some drivers were observed turning right from Old Ellwood Drive onto Coleraine Drive northbound, and then making a U-turn (presumably expecting that Coleraine southbound would receive the green indication before Old Ellwood westbound left-turn), as illustrated in **Figure 13**.

B000738

**Figure 13 – Potential Conflict at Coleraine Drive and Old Ellwood Drive**



On Old Ellwood Drive, when the railway gate was closed during the PM peak hour, westbound right-turning vehicles were observed driving over the unpaved shoulder to go around a left-turning vehicle that was waiting at the stop bar (**Figure 14**). This appears to result in deterioration of the shoulder, creating pavement edge drop-offs.

**Figure 14 - Right-turning Vehicles Driving Over Shoulder at Old Ellwood Drive**



B000738

### 3.7 Active Transportation Facilities

As described in Section 2.5, sidewalks are provided on both side of the road, extending between King Street/Harvest Moon Drive and Old Ellwood Drive. The sidewalks are 1.5 metres wide, which conforms

to AODA requirements,<sup>8</sup> and were generally in good condition, only one location presenting minor damage at a manhole cover opposite to Ellwood Drive West (**Figure 15**).

**Figure 15 - Damaged Sidewalk**



The sidewalks do not continue south of Old Ellwood Drive (and of the railway tracks), although raised asphalt 'splash strips' adjacent to the curb (**Figure 16**) extend towards the south end of the study area.

**Figure 16 – Asphalt 'Strips' South of Old Ellwood Drive**



These paved strips are approximately 1.0 metre wide and could encourage pedestrians to use them as sidewalks, particularly considering that the intersections of Coleraine Drive with Manchester Court and Holland Drive have marked crosswalks and pedestrian signal heads. Additionally, there are no facilities or devices allowing pedestrians to cross the railway tracks (**Figure 17**), therefore occasional pedestrians are likely to either walk on the roadway or on the rails.

<sup>8</sup> O.Reg. 191/11 – Integrated Accessibility Standards, Part IV.1 80.23

**Figure 17 – Sidewalk Termination with No Facilities to Cross Railway Tracks**



The east sidewalk near King Street West is located behind a steel beam guide rail and in front of a retaining wall (**Figure 18**). This narrows the sidewalk's effective width to approximately 1.3 metres which is less than the AODA requirement. This confined space could pose severe inconvenience if, for example, two wheelchair or mobility scooter users meet in opposite directions.

**Figure 18 – Narrow Sidewalk Between Guide Rail and Retaining Wall**



The pedestrian pushbuttons at the intersection of Coleraine Drive with King Street West/Harvest Moon are not fully accessible to pedestrians. Ontario Regulation 413/12 – Integrated Accessibility Standards (Section 80.28) mandates that, by January 2015, all new or replaced pedestrian signals should meet a series of accessibility requirements currently not present at the intersection. For example, there is no locator tone or audible and vibro-tactile walk indicators. The same occurs at King Street West and Station Road, and Coleraine Drive and Old Ellwood Drive. **Figure 19** illustrates the existing pushbuttons. Although there is no legal requirement to immediately replace the push buttons, the grade separation project provides an opportunity to upgrade them and make them fully accessible.

B000738

**Figure 19 – Pedestrian Pushbutton Not Fully Accessible**



As noted in Section 2.5, there are no bicycle facilities along Coleraine Drive; no cyclists were observed during the site visit.

### 3.8 Access Management

During the field investigation, sight distances at accesses along Coleraine Drive were reviewed. Because Coleraine Drive has a predominantly straight and flat alignment, most accesses do not present any sight distance concerns. The exceptions are the departure sight distances for the right-turn movement at # 13351 and #13371 Coleraine Drive (**Figure 20**).

**Figure 20 – Accesses with Potential Departure Sight Distance Restrictions**



There is a small grade south of Holland Drive which may contribute to restricting visibility for the aforementioned movement. The available departure sight distances were measured and compared to TAC requirements. The measurements were made considering a driver eye height of 1.05 m for a

B000738



vehicle turning right onto Coleraine Drive northbound from the two driveways, and a 1.30 m height representing the top of a passenger car approaching in the northbound direction. The results are summarized in **Table 6**. The table provides a comparison considering design speeds of 80 and 90 km/h, 10 and 20 km/h over the posted speed limit at this section of Coleraine Drive, respectively.

**Table 6 – Departure Sight Distances at #13351 and #13371 Coleraine Drive**

Measurement	Design Speed	TAC Requirement <sup>9</sup>	Location	Available	Requirement Met
Right-turn, looking left	80 km/h	250	#13351	300 m	Yes
			#13371	240 – 250 m	Borderline
	90 km/h	310	#13351	300 m	No
			#13371	240 – 250 m	No

The required turning sight distance is not met at both driveways for a design speed of 90 km/h. For a design speed of 80 km/h, the requirement is met at #13351, and is borderline met at #13371.

No conflicts were observed at any of the driveways during the field investigation. The two major accesses in the study area (at the intersections of Manchester Court and Holland Drive), which could have the potential for conflicts (depending on volumes), are signalized and present exclusive left-turn lanes to enter their respective sites (or, in the case of the northbound approach at Holland Drive, a hatched area wide enough next to the centre median to accommodate a left-turn lane, if required).

B000738

<sup>9</sup> Based on Figure 2.3.3.4 – Sight Distance for Turning Movements from Stop; Geometric Design Guide for Canadian Roads.



## 4. Proposed Grade Separation

The need for grade separation on Coleraine Drive is justified by the Rail/Road Crossing Exposure Index (EI), which is the product of daily bi-directional road traffic and train volumes. Typically, grade separation is considered for grade separation where the EI value results 200,000 or higher.

As mentioned in Section 2.7, the Coleraine Drive at-grade rail crossing currently serves 18 freight trains per day and no passenger trains. Information provided by Town of Caledon's technical staff during the completion of the Bolton Commuter Rail Feasibility Report indicates that the projected rail volumes for the 2021 and 2031 horizon years will be 52 and 63, respectively. However, Canadian Pacific Railway (CP) indicated that, although growth in railway traffic may occur as a result of increasing population and economic activity, forecasts of CP traffic levels are not available.

With respect to projected commuter rail service between the communities of Bolton and the City of Toronto, the Bolton Commuter Rail Feasibility Report estimates 6 to 10 peak period commuter trains servicing the corridor by the 2021 horizon year.

Estimated Annual Average Daily Traffic (AADT) for the same years are 15,848 and 20,530, respectively.<sup>10</sup> **Table 7** summarizes the Exposure Indices for the 2015, 2021, and 2031 horizon years. The results indicate that grade separation is justified since 2015.

It should be noted that the table only includes existing train volumes and commuter trains. If volume projections from the Bolton Commuter Rail Feasibility Report are considered, the EI is expected to reach 1,293,390 by 2031.

**Table 7 – Rail/Road Crossing Exposure Index**

Bi-directional Daily Crossings	2015	2021	2031
Vehicular	13,038	15,848	20,530
Train	18	30	30
Exposure Index	234,684	475,440	615,900

There are two options under consideration to undertake the proposed railway grade separation on Coleraine Drive: Road Over Rail and Rail Over Road. Both options are relatively similar in terms of traffic and transportation implications. For the purposes of the traffic assessment, the following changes in the road network have been assumed:

- + Elimination of the intersections of Coleraine Drive with Ellwood Drive West and Old Ellwood Drive;
- + Elimination of three private accesses on the west side of Coleraine Drive, between King Street West/Harvest Moon Drive and Old Ellwood Drive;

<sup>10</sup> Based on the data available in the Region of Peel Data Centre website, the AADT on Coleraine Drive is 13,038 for the year 2015. This AADT was compared to the AM peak hour volumes from recent traffic counts and with the 2041 EMME outputs provided by the Region, resulting in an estimated AADT of 25,213 in 2041. 2021 and 2031 volumes were estimated assuming linear growth between 2015 and 2041. Station 15008000 COLERAINE DRIVE 0.15 KM SOUTH OF HARVEST MOON. Data retrieved from <http://opendata.peelregion.ca/data-categories/transportation/traffic-count-stations.aspx>.

- + Relocation of the signalized access at Coleraine Drive and Manchester Court approximately 140 metres southerly (opposite to #13351 Coleraine Drive); and
- + Relocation of two accesses on the east side of Coleraine Drive (opposite to Manchester Court and 60 metres south thereof), connecting them internally to the existing access at #13351 Coleraine Drive (which will be opposite to the relocated Manchester Court).

The following sections discuss the impacts of these modifications (particularly relating to traffic operations resulting from the closure of the two intersections, which will result in increased traffic volumes at the intersections of Coleraine Drive and King Street West and King Street West and Station Road) as well as recommended improvements to mitigate impacts, provide active transportation facilities, and address safety concerns.



## 5. Future Traffic Operations

This section discusses the impacts of the proposed railway grade separation on traffic operations in the study area. Sections 5.1 to 5.3 include future traffic volume projections, traffic redirection resulting from the elimination of the intersections of Coleraine Drive with Old Ellwood Drive and Ellwood Drive West, and summarize the resulting intersection operational performance of Coleraine Drive and King Street West/Harvest Moon Drive, King Street West and Station Road/Deer Valley Drive, and Old Ellwood Drive and Station Road. Intersection improvements are discussed in Section 6.1.

### 5.1 Background Traffic Growth (Without Grade Separation)

Future intersection volumes resulting from background traffic growth (i.e. resulting from future developments projected by the Region's Planning Department) area were estimated based on EMME model outputs provided the Region for the 2041 horizon year, AM Peak Hour. The volumes for the PM Peak Hour were estimated by applying the same proportion between the 2017 AM and PM link volumes to the 2041 AM volumes from EMME. **Table 8** summarizes the link volumes for 2017 and 2041, for each direction of travel and peak hour, along Coleraine Drive and King Street West.

**Table 8 – 2017 Existing and 2041 Projected Link Volumes**

Road Section	Direction	2017 Volumes (vph)		2041 Volumes (vph)	
		AM <sup>11</sup>	PM	AM <sup>12</sup>	PM <sup>13</sup>
Coleraine Drive south of King Street W	NB	249	1,070	349	1,500
	SB	933	336	1,824	657
King Street W between Coleraine Drive and Station Road	EB	294	433	486	716
	WB	422	338	982	787

The 2041 link volumes above were then used to estimate turning movement volumes at each intersection in the study area. This was done by applying proportions between individual turning movements similar to existing volumes, as well as the following assumptions:

- + Volumes entering or exiting Harvest Moon Drive, Station Road/Deer Valley Drive, and Ellwood Drive West were assumed to present no growth by 2041, since no further development is expected in the residential areas to which these roads provide access; and
- + Consequently, all background traffic growth originates from the north/south directions on Coleraine Drive, and from the east/west directions on King Street West.

As an example, the northbound volumes at Coleraine Drive and King Street West/Harvest Moon Drive were estimated, for the PM Peak Hour, as follows:

- + The northbound left-turn (NBL) movement remained unchanged from the existing volume (363), since this movement enters the residential area via Harvest Moon Drive;

<sup>11</sup> From Turning Movement Counts.

<sup>12</sup> From EMME model outputs provided by the Region.

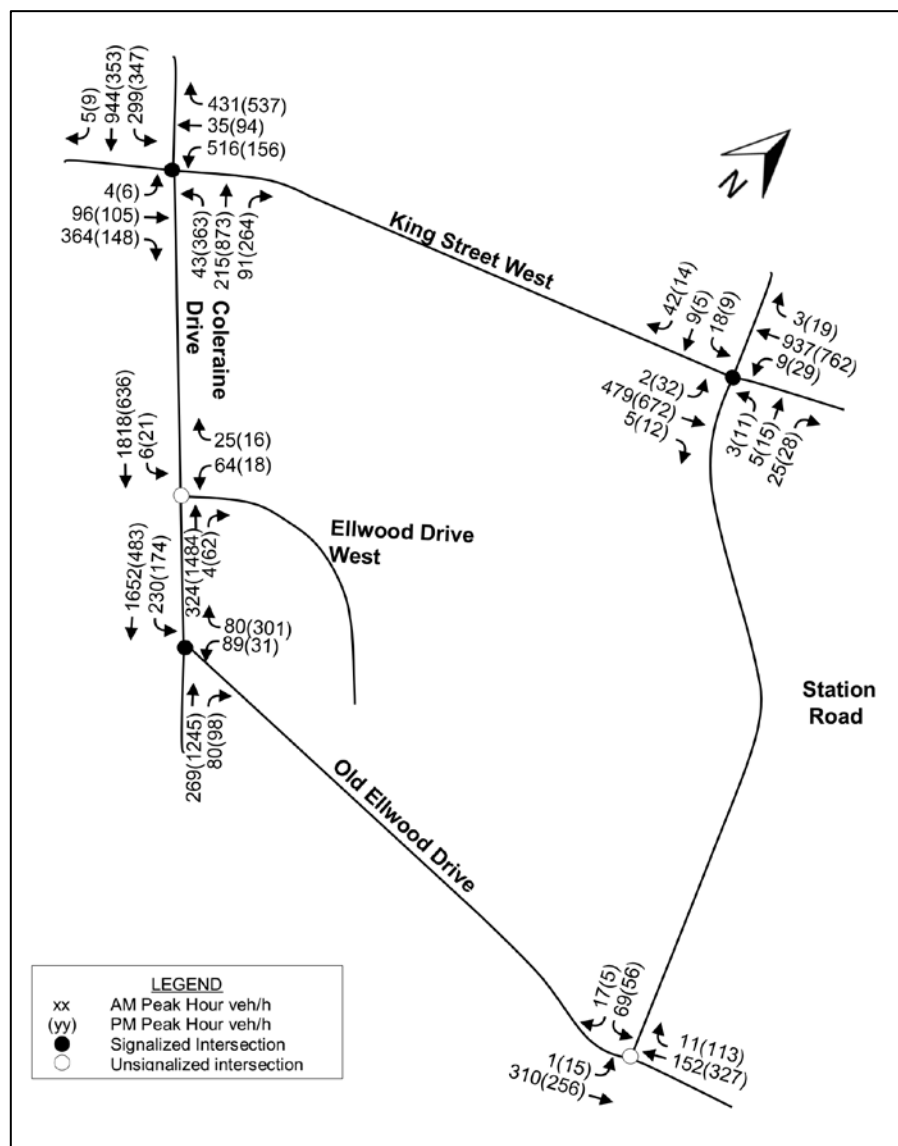
<sup>13</sup> Estimated.



- + The combined northbound through (NBT) and northbound right-turn (NBR) volumes are the difference between the northbound link volume from Table 8 and the NBL volume ( $1,500 - 363 = 1,137$ );
- + Based on 2017 volumes, the NBR volume makes up 23.2% of NBR+NBT ( $164+543$ ). Therefore,  $NBR = 0.232 \times 1,137 = 264$ , and  $NBT = 1,137 - 264 = 873$ ;
- + The procedure is then repeated for the remaining directions and the calculated volumes are carried over to the remaining intersections until all future volumes have been estimated.

The resulting background traffic volumes are illustrated in **Figure 21**.

**Figure 21 – 2041 Intersection Volumes (Without Grade Separation)**



B0000738

## 5.2 Traffic Redirection (With Grade Separation)

With the elimination of the intersections of Coleraine Drive with Ellwood Drive West and Old Ellwood Drive, the drivers using these intersections need to find alternatives to complete their trips. Most of these traffic volumes are expected to migrate to the intersections of Coleraine Drive and King Street West/Harvest Moon Drive and King Street West and Station Road/Deer Valley Drive.

The procedure to reassign the traffic volumes resulting from the elimination of these two intersections included two steps. The first corresponds to the redirection of traffic associated with trips between Harvest Moon Drive and Old Ellwood Drive. The reason for this is that, upon reviewing existing traffic volumes (refer to Section 2.2, Figure 3), the eastbound right-turn from Harvest Moon Drive and the southbound left-turn onto Old Ellwood Drive were found to be relatively high during the AM Peak Hour (364 and 121, respectively); the same occurs in the PM peak hour, however in the opposite direction (i.e. westbound right-turn from Old Ellwood Drive and northbound left-turn onto Harvest Moon Drive: 224 and 363, respectively). It was assumed that residents from the neighbourhood located west of Coleraine Drive and Harvest Moon Drive use Old Ellwood Drive as alternative route between this neighbourhood and Highway 50, bypassing Downtown Bolton.

For this reason, there was a need to determine the volumes associated with these movements, since they should be reassigned to different movements at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive, compared to general traffic. For example, the portion of the 224 vehicles turning right from Old Ellwood Drive, and then left onto Harvest Moon Drive in the PM Peak Hour should be reassigned to the westbound through movement at King Street/Harvest Moon and Coleraine Drive, and the remaining portion should be reassigned to the westbound right-turn movement.

In order to determine these proportions, Bluetooth detectors were deployed to identify vehicles travelling between Harvest Moon Drive and Old Ellwood Drive. However, the detection rate of the devices resulted very low and the Bluetooth data was inconclusive. As such, CIMA conducted a manual count during the field investigation on Thursday, March 9, 2017. The results are summarized in **Table 9** and were used to estimate the amount of traffic redirected to the eastbound and westbound through movements at King Street/Harvest Moon Drive and Coleraine Drive.

**Table 9 – Proportion of Traffic between Harvest Moon Drive and Old Ellwood Drive**

Movement	AM Peak	PM Peak	%
Total right turns Harvest Moon → Coleraine	287	-	11%
<i>Harvest Moon → Coleraine → Old Ellwood</i>	32	-	
Total right turns Old Ellwood → Coleraine	-	210	52%
<i>Old Ellwood → Coleraine → Harvest Moon</i>	-	110	

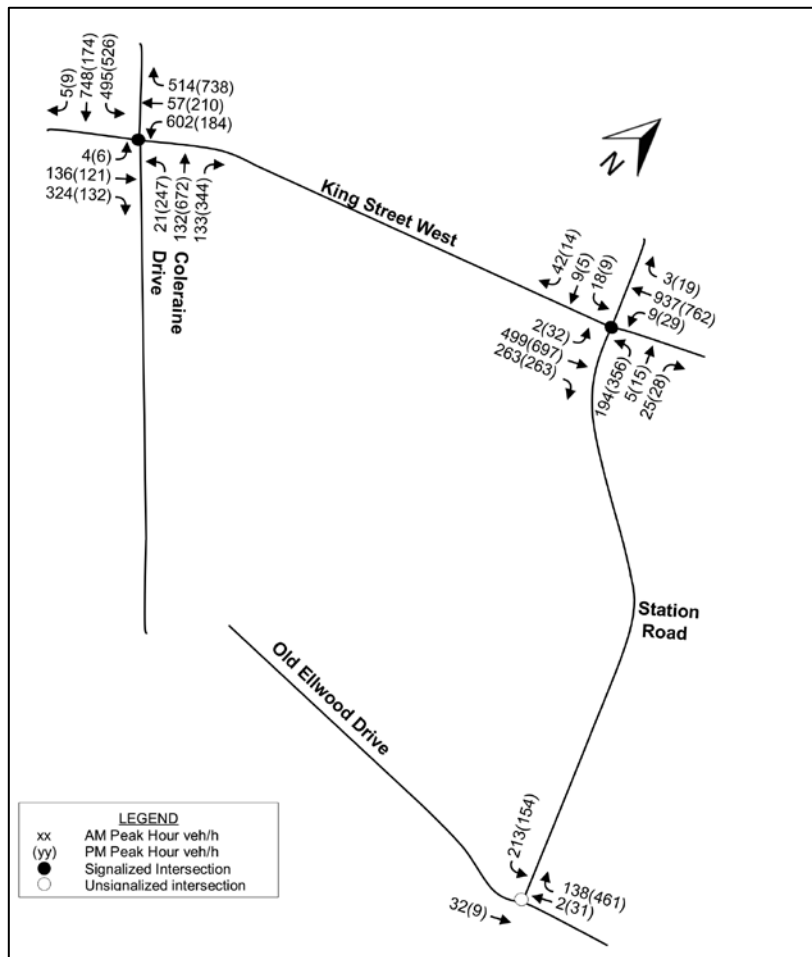
The second step consisted in reassigning the remaining volumes (i.e. after the first step was completed) to the appropriate movements. In order to complete this, the following assumptions were used:

B000738

- + All traffic turning north onto Coleraine Drive from Ellwood Drive West and from Old Ellwood Drive were reassigned to the northbound left-turn at Station Road and King Street west, then to the westbound right-turn at King Street West and Coleraine Drive;
- + 50% of traffic turning south onto Coleraine Drive from Ellwood Drive West and from Old Ellwood Drive were reassigned to the northbound left-turn at Station Road and King Street west, then to the westbound left-turn at King Street West and Coleraine Drive; and
- + The remaining 50% of traffic turning south onto Coleraine Drive from Ellwood Drive West and from Old Ellwood Drive were assumed to take alternative routes towards Highway 50 (i.e. proceeding eastbound on Old Ellwood Drive).

The resulting traffic volumes, which were used in the review of intersection operations, are illustrated in **Figure 22**.

**Figure 22 – 2041 Intersection Volumes (With Grade Separation)**



B000738

### 5.3 Intersection Operations

**Table 10** summarizes intersection operations in the study area for the 2041 horizon year, without implementing the railway grade separation (i.e. Do-Nothing option). Under this scenario, there are no major capacity or LOS issues, with all intersections and individual movements operating under capacity (v/c ratio not higher than 0.90) and with LOS E or better, the longest delays being slightly over 1 minute for non-through movements, which is expected at busy intersections during peak hours.

Although 95<sup>th</sup> percentile queues associated with the railway crossing were not reported to be a major concern, the SimTraffic animation shows that, during the AM peak hour, southbound queues on Coleraine Drive, may reach the King Street West/Harvest Moon intersection (**Figure 23**).

Additionally, several movements, particularly at Coleraine Drive and King Street West, are expected to present queues that exceed available storage.

**Table 10 – 2041 Intersection Operations Without Grade Separation**

Direction	Mov.	Storage Length	AM Peak Hour				PM Peak Hour			
			v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>Coleraine Drive and King Street West/Harvest Moon Drive (Signalized)</b>										
EB	L/T	-	0.26	34.2	C	57	0.42	51.6	D	42
	R	20	0.61	42.9	D	77	0.23	47.5	D	22
WB	L	57	0.92	44.4	D	154	0.50	37.8	D	54
	T	-	0.07	16.3	B	235	0.21	35.8	D	29
	R	60	0.36	20.1	C	19	0.68	48.8	D	74
NB	L	65+	0.42	33.2	C	25	0.69	27.0	C	75
	T	-	0.35	35.2	D	52	0.82	45.2	D	203
	R	35	0.07	32.3	C	21	0.46	35.5	D	117
SB	L	70	0.79	38.0	D	105	0.95	66.8	E	109
	T/R	-	0.89	47.8	D	145	0.32	26.2	C	58
<b>Overall</b>		-	<b>0.94</b>	<b>38.7</b>	<b>D</b>	-	<b>0.89</b>	<b>43.2</b>	<b>D</b>	-
<b>Coleraine Drive and Ellwood Drive West (Unsignalized)</b>										
WB	L/R	-	0.27	15.5	C	71	0.13	17.4	C	19
NB	T/R	-	0.15	0	A	-	0.64	0	A	4
SB	L	60	0.02	8.8	A	13	0.06	12.9	B	13
	T	-	0.61	0	A	135	0.20	0	A	11
<b>Overall</b>		-	<b>0.62</b>	<b>0.8</b>	<b>B</b>	-	<b>0.53</b>	<b>0.5</b>	<b>A</b>	-
<b>Coleraine Drive and Old Ellwood Drive</b>										
WB	L/R	-	0.63	33.1	C	52	0.86	61.3	E	196
NB	T/R	-	0.31	13.6	B	19	0.88	27.0	C	22
SB	L	20	0.41	5.4	A	52	0.83	45.7	D	51
	T	-	0.86	13.8	B	108	0.23	5.4	A	71
<b>Overall</b>		-	<b>0.91</b>	<b>14.4</b>	<b>B</b>	-	<b>0.89</b>	<b>30.1</b>	<b>C</b>	-

B000738



Direction	Mov.	Storage Length	AM Peak Hour				PM Peak Hour			
			v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>King Street West and Station Road/Deer Valley Drive</b>										
EB	L	23	0.03	4.5	A	3	0.09	3.1	A	13
	T/R	-	0.48	7.1	A	45	0.53	5.5	A	69
WB	L	75	0.04	4.0	A	7	0.11	3.1	A	14
	T/R	-	<b>0.90</b>	20.7	C	92	0.63	7.0	A	62
NB	L	28	0.06	29.9	C	5	0.17	34.1	C	10
	T/R	-	0.08	29.9	C	13	0.16	33.9	C	16
SB	L	30	0.14	30.4	C	11	0.14	33.9	C	8
	T/R	-	0.52	33.9	C	19	0.10	33.5	C	11
<b>Overall</b>	-	-	<b>0.84</b>	<b>18.1</b>	<b>B</b>	-	<b>0.58</b>	<b>8.1</b>	<b>A</b>	-
<b>Old Ellwood Drive and Station Road</b>										
EB	L/T	-	0.47	11.5	B	25	0.47	11.9	B	25
WB	T/R	-	0.29	9.5	A	18	0.62	14.4	B	28
SB	L/R	-	0.18	9.5	A	18	0.14	9.8	A	15
<b>Overall</b>	-	-	<b>0.28</b>	<b>10.5</b>	<b>A</b>	-	<b>0.35</b>	<b>13.1</b>	<b>A</b>	-

*Notes:*

The northbound left-turn lane on Coleraine and King continues as a two-way left-turn lane

NR: Not reported

**Figure 23 – 2041 AM Southbound Queues During Train Crossing**



B000738

If the grade separation is implemented, vehicles on Coleraine Drive no longer need to wait for trains to clear the crossing, therefore the queuing issue described above will no longer be a concern. However, due to traffic redirection (as described in Section 5.2), increased volumes are expected to cause some movements to operate over capacity and/or with excessive delays. **Table 11** summarizes intersection operations in the study area for the 2041 horizon year, with the railway grade separation in place.

**Table 11 – 2041 Intersection Operations With Grade Separation**

Direction	Mov.	Storage Length	AM Peak Hour				PM Peak Hour			
			v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>Coleraine Drive at King Street/Harvest Moon Drive</b>										
EB	L/T	-	0.39	43.6	D	60	0.36	43.8	D	46
	R	20	0.55	48.4	D	69	0.18	40.4	D	18
WB	L	57	1.04	76.2	E	181	0.53	35.3	D	51
	T	-	0.10	16.8	B	640	0.40	35.8	D	68
	R	60	0.39	21.0	C	11	0.83	54.8	D	96
NB	L	65+	0.12	38.5	D	16	0.58	37.0	D	71
	T	-	0.25	43.6	D	40	0.90	64.8	E	169
	R	35	0.10	42.0	D	29	0.77	58.8	E	118
SB	L	70	1.04	87.0	F	510	1.01	76.9	E	169
	T/R	-	0.63	37.8	D	505	0.15	20.0	C	71
<b>Overall</b>		-	<b>0.81</b>	<b>51.4</b>	<b>D</b>	-	<b>0.90</b>	<b>54.3</b>	<b>D</b>	-
<b>Station Road at King Street West</b>										
EB	L	23	0.07	11.2	B	15	0.17	12.2	B	52
	T/R	-	1.11	85.8	F	122	0.99	49.6	D	268
WB	L	75	0.32	24.5	C	49	0.93	123.3	F	43
	T/R	-	0.97	42.8	D	702	0.75	22.3	C	132
NB	L	28	1.43	249.1	F	79	1.23	162.9	F	93
	T/R	-	0.05	32.9	C	52	0.06	32.6	C	74
SB	L	30.0	0.15	50.2	D	13	0.16	59.7	E	8
	T/R	-	0.59	58.2	E	24	0.12	60.1	E	13
<b>Overall</b>		-	<b>1.08</b>	<b>93.2</b>	<b>F</b>	-	<b>1.05</b>	<b>68.3</b>	<b>E</b>	-
<b>Old Ellwood Drive at Station Road</b>										
EB	L/T	-	0.00	8.1	A	0	0.02	8.1	A	8
WB	T/R	-	0.41	9.8	A	13	0.57	12.0	B	26
SB	L/R	-	0.41	11.3	B	22	0.29	10.3	B	18
<b>Overall</b>		-	<b>0.27</b>	<b>10.5</b>	<b>A</b>	-	<b>0.45</b>	<b>11.5</b>	<b>A</b>	-

*Notes:*

*The northbound left-turn lane on Coleraine and King continues as a two-way left-turn lane*

B000738

Based on these results, the following movements are expected to require improvements (beyond signal timing optimization):

- + Coleraine Drive and King Street West/Harvest Moon Drive:
  - Westbound left-turn, with a v/c of 1.04 in the AM peak;
  - Southbound left-turn, with a v/c of 1.04 in the AM peak, and 1.01 in the PM peak;
- + King Street West and Station Road/Deer Valley Drive:
  - Eastbound through, with a v/c of 1.11 in the AM peak, and 0.99 in the PM peak;
  - Westbound through, with a v/c of 0.97 in the AM peak; and
  - Northbound left-turn, with a v/c of 1.43 in the AM peak, and 1.23 in the PM peak.

Additionally, various movements present increased queues compared with the scenario without the grade separation. This is due to the increase volumes, particularly for some left-turn movements. Excessive delays (LOS F) are expected for the southbound left-turn at Coleraine and King, and for the eastbound through and northbound left-turn at King and Station.

Improvements to address these operational concerns are discussed in Section 6.1.



## 6. Transportation Improvements

This section provides explores improvements to address operational and safety concerns in the study area, as well as for active transportation facilities. Improvements are discussed for scenarios with and without the Coleraine Drive grade separation being in place.

### 6.1 Intersection Operations

#### 6.1.1 Intersection Capacity Improvements Without Grade Separation

As discussed in Section 5.3 the expected intersection operational issues by the 2041 horizon year include southbound queues on Coleraine Drive occasionally reaching the King Street West/Harvest Moon intersection, and some movements where queues exceed available storage. In order to address these issues, the following intersection improvements can be implemented:

- + Coordinate the traffic signal at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive with the railway signals/gates to prevent queues from reaching the former;
- + Extend storage lengths as indicated in **Table 12**.

**Table 12 – Storage Length Improvements without Grade Separation**

Intersection	Movement	Existing Storage (m)	Recommended Storage (m)
Coleraine Drive and King Street W/Harvest Moon Drive	EBR	20	80*
	WBL	57	155
	WBR	60	75
	NBR	35	120
	SBL	70	110
Coleraine Drive and Old Elwood Drive	SBL	20	55

\* Consider extending to Frank Johnston Road

#### 6.1.2 Intersection Capacity Improvements Without Grade Separation

In order to address the operational issues resulting from the grade separation (as identified in Section 5.3), the following improvements were included in the Synchro/SimTraffic model:

- + Coleraine Drive and King Street West/Harvest Moon Drive:
  - Dual left-turn lanes in the southbound and westbound approaches;
- + King Street West and Station Road/Deer Valley Drive:
  - Exclusive right-turn lane in the eastbound direction;
  - One additional through lane in the westbound direction;
  - Exclusive northbound left-turn phase.

Additionally, because of the need for additional receiving lanes on both ends of the King Street West segment (resulting from the dual southbound left-turn lanes at Coleraine and King and the additional westbound through lane at King and Station), and considering the exclusive right-turn lanes at King and Coleraine westbound and King and Station eastbound, the entire section of King Street West between Coleraine Drive and Station Road would be widened to four lanes. Although this does not affect operational performance, it reduces the need for frequent lane changes, which could contribute to rear end and sideswipe collisions.

The resulting traffic operations are summarized in **Table 13**.

**Table 13 – 2041 Intersection Operations With Grade Separation + Intersection Improvements**

Direction	Mov.	Storage Length	AM Peak Hour				PM Peak Hour			
			v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>Coleraine Drive at King Street/Harvest Moon Drive</b>										
EB	L/T	-	0.38	41.1	D	73	0.32	38.5	D	41
	R	20	0.58	45.1	D	<b>81</b>	0.16	35.7	D	20
WB	L	57	0.92	68.6	E	<b>96</b>	0.68	65.4	E	34
	T	-	0.11	17.7	B	20	0.34	28.1	C	50
	R	60	0.39	22.0	C	22	0.87	50.5	D	<b>90</b>
NB	L	65+	0.37	67.9	E	24	0.84	71.7	E	88
	T	-	0.25	43.3	D	39	0.87	59.0	E	110
	R	35	0.10	41.7	D	28	0.73	53.9	D	<b>79</b>
SB	L	70	0.92	72.3	E	<b>85</b>	0.94	73.1	E	<b>88</b>
	T/R	-	0.62	36.6	D	105	0.26	38.9	D	42
<b>Overall</b>		-	<b>0.73</b>	<b>47.2</b>	<b>D</b>	-	<b>0.91</b>	<b>55.0</b>	<b>E</b>	-
<b>Station Road at King Street West</b>										
EB	L	23	0.03	16.4	B	3	0.13	14.3	B	<b>38</b>
	T	-	0.68	27.9	C	95	0.73	25.0	C	128
	R	-	0.46	22.2	C	40	0.29	15.6	B	30
WB	L	75	0.08	17.2	B	9	0.27	1.0	B	17
	T/R	-	0.66	25.3	C	72	0.45	17.2	B	60
NB	L	28	0.84	37.9	D	<b>52</b>	0.99	66.2	E	<b>86</b>
	T/R	-	0.04	20.5	C	11	0.05	23.3	C	52
SB	L	30.0	0.16	49.7	D	15	0.17	53.7	D	9
	T/R	-	0.60	56.8	E	19	0.11	53.0	D	13
<b>Overall</b>		-	<b>0.71</b>	<b>29.2</b>	<b>C</b>	-	<b>0.82</b>	<b>31.2</b>	<b>C</b>	-

B0000738

Direction	Mov.	Storage Length	AM Peak Hour				PM Peak Hour			
			v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>Old Ellwood Drive at Station Road</b>										
<b>EB</b>	L/T	-	0.05	8.5	A	13	0.02	8.1	A	10
<b>WB</b>	T/R	-	0.41	10.1	B	14	0.57	12.0	B	31
<b>SB</b>	L/R	-	0.41	11.6	B	24	0.29	10.3	B	19
<b>Overall</b>		-	<b>0.27</b>	<b>10.6</b>	<b>A</b>	-	<b>0.45</b>	<b>11.5</b>	<b>B</b>	-

*Notes:*

The northbound left-turn lane on Coleraine and King continues as a two-way left-turn lane

NR: Not reported

With the improvements, most of the movements that were over capacity are expected to operate under capacity and within the thresholds outlined in Region of Peel's Traffic Impact Studies Terms of Reference, as follows:

- + Coleraine Drive and King Street West/Harvest Moon Drive:
  - Westbound left-turn v/c improves from 1.04 to 0.92 in the AM peak;
  - Southbound left-turn v/c improves from 1.04 to 0.92 in the AM peak, and from 1.01 to 0.94 in the PM peak;
- + King Street West and Station Road/Deer Valley Drive:
  - Eastbound through v/c improves from 1.11 to 0.68 in the AM peak, and from 0.99 to 0.73 in the PM peak;
  - Westbound through v/c improves from 0.97 to 0.66 in the AM peak; and
  - Northbound left-turn v/c improves from 1.43 to 0.84 in the AM peak, and from 1.01 to 0.99 in the PM peak.

However, some queues still exceed available storage. **Table 14** provides the required storage length improvements for both existing and new lanes.

**Table 14 – Storage Length Improvements with Grade Separation**

Intersection	Movement	Existing Storage (m)	Recommended Storage (m)	Notes
Coleraine Drive and King Street W/Harvest Moon Drive	EBR	20	80	Consider extending to Frank Johnston Road
	WBL	57	100	
	WBR	60	500	Extend to Station Road
	NBR	35	80	
	SBL	70	90	
King Street W and Station Road/Deer Valley Drive	EBL	23	40	
	EBR	–	500	Extend to Coleraine Drive
	WBT/R	–	75	
	NBT/R	28	90	To prevent lane starvation caused by NBL queues

### 6.1.3 Roundabout Option

As an alternative to a signalized intersection, consideration may also be given to converting the intersection of Coleraine Drive and King Street West/Harvest Moon Drive to a roundabout. A review of intersection operations was conducted using Arcady software, for the horizon year 2041, with and without the proposed grade separation. The results of the roundabout analysis are summarized in **Table 15**.

**Table 15 – 2041 Roundabout Operations at Coleraine Dr and King St/Harvest Moon Dr**

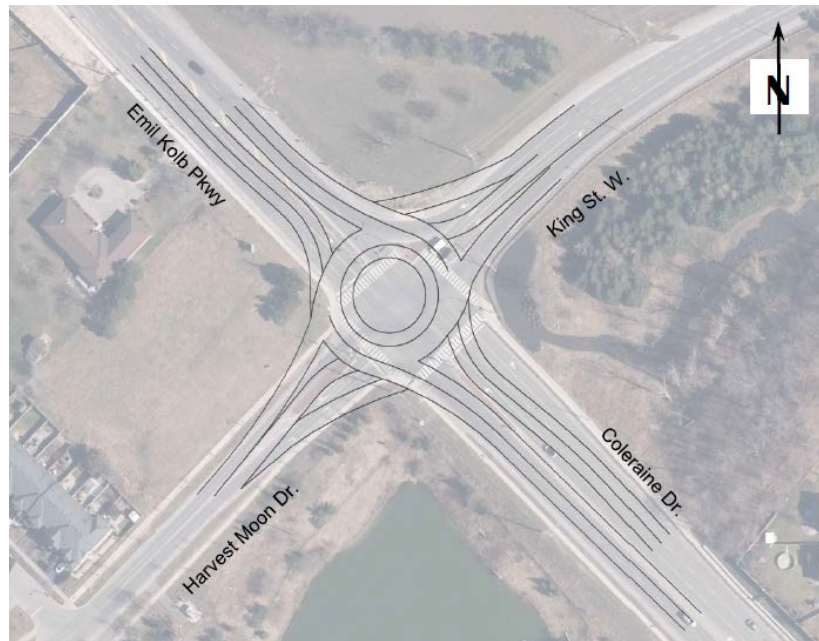
Direction	Movement	AM Peak Hour				PM Peak Hour			
		v/c	Delay	LOS	Queue	v/c	Delay	LOS	Queue
<b>2041 Without Grade Separation</b>									
EB	LTR	0.72	85.2	F	10	0.18	7.1	A	1
WB	LTR	0.60	10.2	B	2	0.57	19.5	C	6
NB	LTR	0.23	3.2	A	1	0.91	23.1	C	48
SB	LTR	0.85	16.4	C	28	0.49	5.0	A	2
<b>Overall</b>		-	22.9	C	-	-	16.8	C	-
<b>2041 With Grade Separation</b>									
EB	LTR	1.29	394.8	F	35	0.19	7.2	A	1
WB	LTR	0.68	11.7	B	6	0.41	6.5	A	3
NB	LTR	0.21	3.3	A	1	0.38	3.8	A	3
SB	LTR	0.87	19.3	C	32	0.47	4.7	A	2
<b>Overall</b>		-	69.0	F	-	-	5.1	A	-

*Note: analysis considered 90% intercept (i.e. capacity reduced to 90%) as a conservative approach.*

The results correspond to a two-lane roundabout, with two entry lanes on Coleraine Drive, and one entry lane with right-turn by-pass on King Street West and Harvest Moon Drive (**Figure 24**). The results

show that a roundabout may be feasible from a capacity perspective, although some movements approach or exceed capacity (most notably the eastbound approach under the scenario with grade separation, with a v/c ratio of 1.29 and LOS F in the AM peak hour). It should be noted, however, that these results represent a conservative approach, where the modelled roundabout capacity was reduced to 90%. If this capacity reduction is not applied, the eastbound approach v/c ratio is improved from 1.29 to 0.57, and the LOS improves from F to D.

**Figure 24 – Roundabout Concept**



## 6.2 Traffic Safety

### 6.2.1 Safety Improvements Without Grade Separation

Based on the findings from the field investigation, the improvements in **Table 16** can address safety concerns within the study area if the Coleraine Drive grade separation is not implemented.

**Table 16 – Safety Improvements without Grade Separation**

Finding	Recommendation
Railway crossing gate obstructing visibility at Old Ellwood Drive and Coleraine Drive.	Consider relocating the railway gate structure (increase offset from the road) to improve sight lines.
Negative left-turn lane offsets at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive.	Provide positive left-turn lane offsets to improve sight lines for left-turning vehicles.
Uneven pavement surface at railway crossing.	Resurface pavement at and on approach to the railway crossing.
RAILWAY CROSSING AHEAD (Wc-4) warning signs installed too close to railway crossing.	Relocate signs in accordance with OTM Book 6 guidance

B0000738

Finding	Recommendation
SCHOOL CROSSING AHEAD (Wc-2A) signs located in advance of signalized intersection (Coleraine and King/Harvest Moon).	Remove the Wc-2A signs in advance of Coleraine and King/Harvest Moon.
Speed limit variation over a short distance on King Street West.	Implement a uniform speed limit on King Street West between Coleraine Drive and Station Road.
Potential water hazards on Coleraine and Harvest Moon and Station and King.	No action is required.
Guide rail installed 1 metre from barrier curb and reducing sidewalk width.	All required guide rails within the study area should be installed either flush with the barrier curb or not closer than 2.5 metres from the barrier curb (4.0 metres desirable if design speed is greater than 70 km/h).
Potential vehicle conflicts at Coleraine and Old Ellwood and Coleraine and Ellwood.	Consider adding an exclusive right-turn lane on Old Ellwood Drive, and providing a raised median island on Coleraine Drive, immediately south of Elwood Drive West.
Absence of sidewalks south of the railway and of pedestrian facilities to cross the railway.	Consider providing sidewalks along Coleraine Drive through the entire study area (refer to Section 6.2.3 for further details, including bicycle facilities), as well as proper crossing facilities at the railway.
Non-AODA pedestrian pushbuttons.	Upgrade pedestrian signal pushbuttons at all intersections in the study area to meet AODA requirements.
Restricted turning sight distances at #13351 and #13371 Coleraine Drive.	Consider modifying the vertical profile of Coleraine Drive in the vicinity of Holland Drive to ensure turning sight distances at all accesses meet design guidelines.

## 6.2.2 Safety Improvements With Grade Separation

Based on the findings from the field investigation, the improvements in **Table 17** can address safety concerns within the study area if the Coleraine Drive grade separation is implemented.

**Table 17 – Safety Improvements with Grade Separation**

Finding	Recommendation
Railway crossing gate obstructing visibility at Old Ellwood Drive and Coleraine Drive.	No action is required. This issue will be eliminated with the implementation of the grade separation.
Negative left-turn lane offsets at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive.	Provide positive left-turn lane offsets to improve sight lines for left-turning vehicles.
Uneven pavement surface at railway crossing.	No action is required. This issue will be eliminated with the implementation of the grade separation.
RAILWAY CROSSING AHEAD (Wc-4) warning signs installed too close to railway crossing.	No action is required. This issue will be eliminated with the implementation of the grade separation.
SCHOOL CROSSING AHEAD (Wc-2A) signs located in advance of signalized intersection (Coleraine and King/Harvest Moon).	Remove the Wc-2A signs in advance of Coleraine and King/Harvest Moon.
Speed limit variation over a short distance on King Street West.	Implement a uniform speed limit on King Street West between Coleraine Drive and Station Road.
Potential water hazards on Coleraine and Harvest Moon and Station and King.	As part of the design efforts, review clear zone requirements and embankment hazard protection warrants for the bodies of water located at the southwest quadrants of Coleraine Drive and Harvest Moon Drive, and Station Road and King Street West; install guide rails as required.
Guide rail installed 1 metre from barrier curb and reducing sidewalk width.	All required guide rails within the study area should be installed either flush with the barrier curb or not closer than 2.5 metres from the barrier curb (4.0 metres desirable if design speed is greater than 70 km/h).
Potential vehicle conflicts at Coleraine and Old Ellwood and Coleraine and Ellwood.	No action is required. This issue will be eliminated with the implementation of the grade separation.
Absence of sidewalks south of the railway and of pedestrian facilities to cross the railway.	Provide sidewalks along Coleraine Drive through the entire study area (refer to Section 6.2.3 for further details, including bicycle facilities). Crossing facilities at the railway are not necessary due to the grade separation.
Non-AODA pedestrian pushbuttons.	Upgrade pedestrian signal pushbuttons at all intersections in the study area to meet AODA requirements.
Restricted turning sight distances at #13351 and #13371 Coleraine Drive.	Consider modifying the vertical profile of Coleraine Drive in the vicinity of Holland Drive to ensure turning sight distances at all accesses meet design guidelines.

## 6.2.3 Roundabout Option

A roundabout has several safety benefits, since the number of conflict points is reduced compared to a typical signalized 4-leg intersection; speeds and the impact angles at a roundabout are also reduced. Converting a signalized intersection to a modern roundabout can reduce total collisions by 21%, and

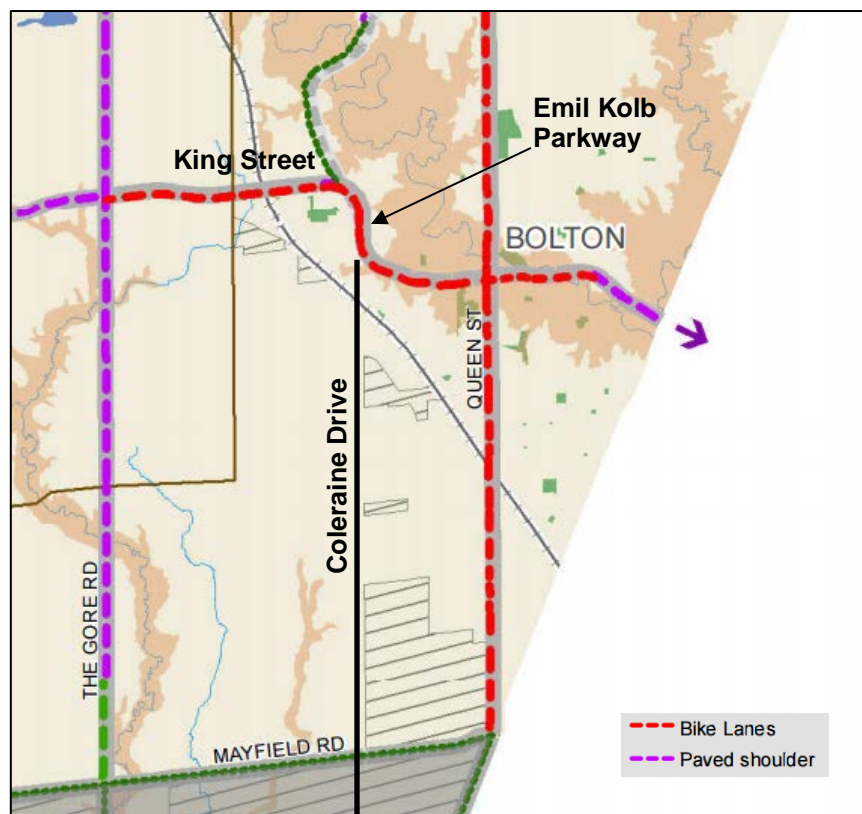
B0000738

severe collisions (i.e. fatal and injury) by 66%.<sup>14</sup> The feasibility of implementing a roundabout at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive should be considered.

### 6.3 Active Transportation

The Region's Active Transportation Study<sup>15</sup> does not identify any planned bicycle facilities along Coleraine Drive, however the proposed long-term Regional cycling network (Map 10a, illustrated in **Figure 25**) indicates that bicycle lanes are planned along King Street, between The Gore and Queen Street. This includes Emil Kolb Parkway, which is a direct continuation of Coleraine Drive north of King Street West. However, the Bolton Transportation Master Plan<sup>16</sup> identifies a proposed buffered bicycle lane along King Street and Coleraine Drive (**Figure 26**).

**Figure 25 – Long-term Regional Cycling Network in Bolton**



B000738

<sup>14</sup> <http://www.cmfclearinghouse.org/detail.cfm?facid=4184> and <http://www.cmfclearinghouse.org/detail.cfm?facid=4185>.

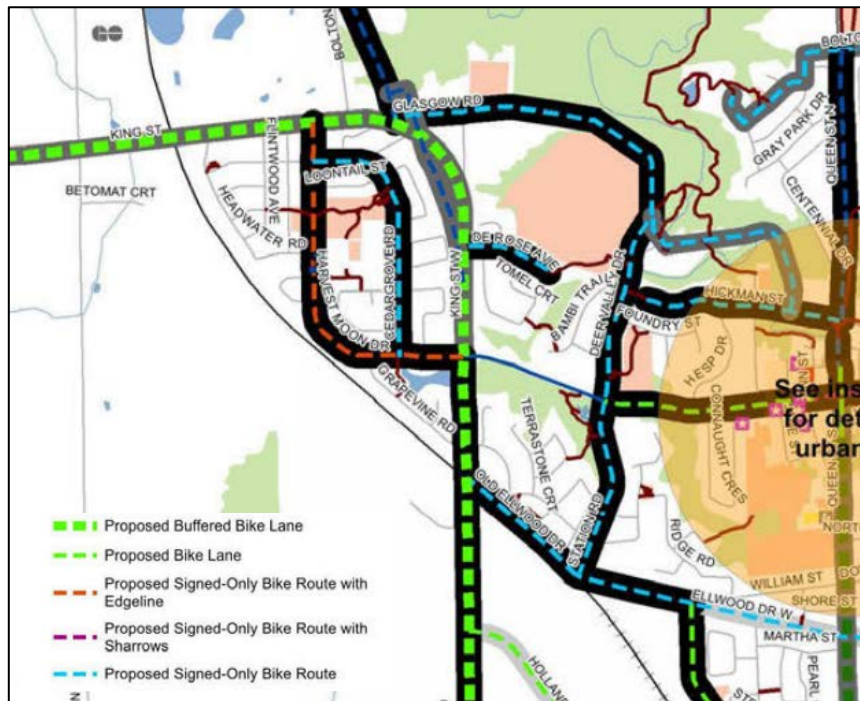
<sup>15</sup> The Region of Peel's Active Transportation Study, IBI Group, November 2011.

<sup>16</sup> <https://www.caledon.ca/en/townhall/resources/D3BoltonTransportationMasterPlan.pdf>





Figure 26 – Bolton Transportation Master Plan: Active Transportation Strategy

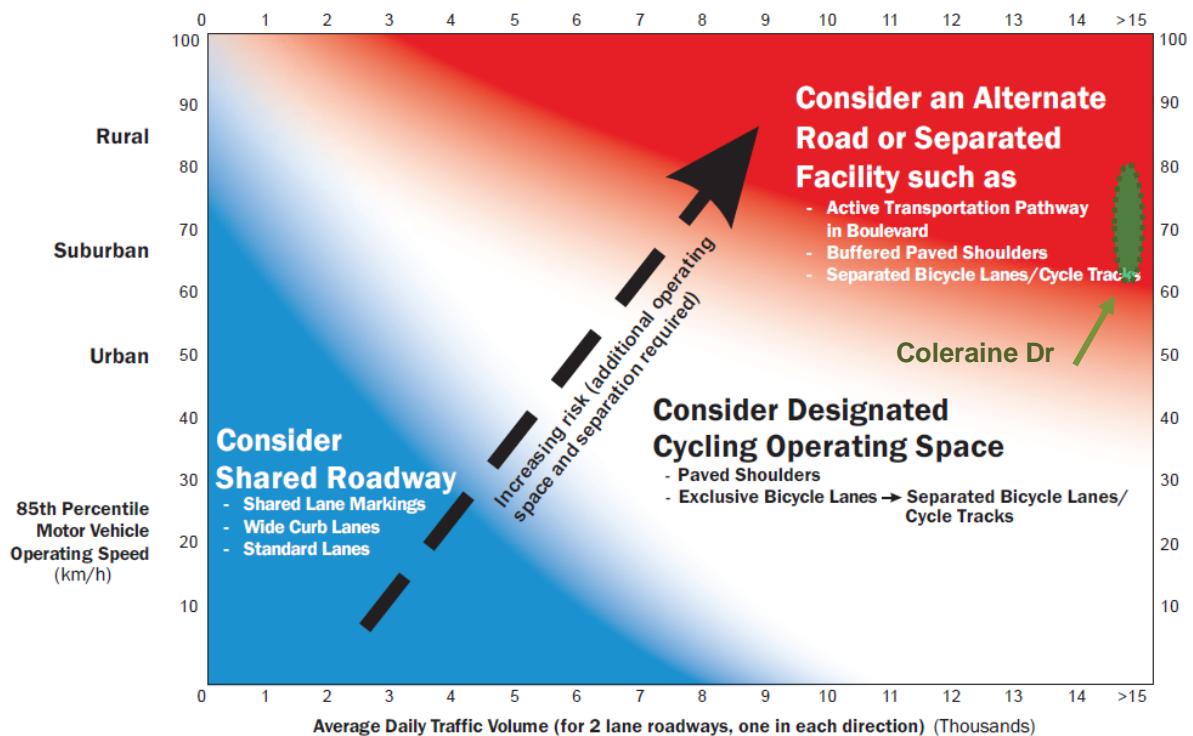


OTM Book 18 – Bicycle Facilities outlines a process for the selection of bicycle facilities, including pre-selection and detailed assessment steps. However, the process is more focused on the selection of bicycle facilities on two-lane roads. If the OTM Book 18 “Desirable Cycling Facility Pre-Selection Nomograph” is assumed to be applicable for a four-lane road (and also considering that future AADT is expected to be 67% higher<sup>17</sup> than the upper limit of the nomograph), the resulting desirable facility would include alternate road or separate facilities such as buffered paved shoulders and separated bicycle lanes/cycle tracks (**Figure 27**).

B0000738

<sup>17</sup> Based on the data available in the Region of Peel Data Centre website, the AADT on Coleraine Drive is 13,038 for the year 2015. This AADT was compared to the AM peak hour volumes from recent traffic counts and with the 2041 EMME outputs provided by the Region, resulting in an estimated AADT of 25,213 in 2041. Station 15008000 COLERAINE DRIVE 0.15 KM SOUTH OF HARVEST MOON. Data retrieved from <http://opendata.peelregion.ca/data-categories/transportation/traffic-count-stations.aspx>.

Figure 27 – OTM Book 18 Desired Cycling Facility Pre-Selection Nomograph



Another important consideration is the land use of the study area, which contains major industrial accesses, therefore large trucks are to be expected which could be dangerous for cyclists on a shared facility. Additionally, separate facilities may attract new bicycle users that are not comfortable riding on a space shared with motor vehicles (especially trucks).

Considering all these elements, the buffered bicycle lanes proposed in the Bolton Transportation Master Plan appears to be adequate, since it provides system continuity and the potential to attract new bicycle users due to increased comfort and safety. For increased safety, however, separated bicycle lanes can also be considered.

## 6.4 Access Management

The implementation of the proposed grade separation will reduce the total number of access points on Coleraine Drive compared to the existing conditions, by either eliminating or combining multiple accesses into a smaller number, as outlined in Section 4. The only potential concern relates to the relocation of the Manchester Court signalized access, which would be approximately 230 metres north from the Holland Drive signalized access.

The Region of Peel's Road Characterization Study recommends a minimum spacing of 300 metres on Suburban Connectors, and 450 metres on Industrial Connectors, between median openings for full-movement accesses. Therefore, if a median were to be provided, the minimum recommended spacing would not be met.

B0000738

Currently, Coleraine Drive has a centre left-turn lane between Manchester Court and Holland Drive, which turns into exclusive left-turn lanes at the signals. This configuration should be maintained in order to remove vehicles entering any remaining accesses in the study area from through traffic, reducing potential conflicts.

It should also be noted that the distance between the proposed signalized accesses after relocation (230 metres) is close to the minimum spacing recommended in OTM Book 12 – Traffic Signals. Although a distance of 215 metres is usually sufficient to allow motorists to recognize and react to the signal at each intersection (i.e. without mistaking one for the other), this may not be sufficient to provide optimal coordination. As such, traffic signal design efforts should carefully review coordinated operations to estimate efficient progression along Coleraine Drive.

B000738

## 7. Conclusions

Based on the findings from this traffic assessment report, the following can be concluded:

- + The Rail/Road Crossing Exposure Index (EI) already exceeded 200,000, the minimum value typically used to consider grade separation, in 2015 (234,648). The EI is expected to reach 615,900 by 2031.
- + With the increase in motor vehicle and train traffic, queues generated at the at-grade crossing are expected to extend beyond the intersection of Coleraine Drive & King Street West/Harvest Moon Drive. This issue is expected to be more intense as the frequency of trains during peak hours increases, particularly due to the planned extension of GO Train service to a new Bolton station.
- + Expected benefits of providing grade separation on Coleraine Drive include:
  - Elimination of queuing issues originating at the railway crossing;
  - Reduced exposure to collisions with trains (although recent collision history did not indicate this to be a major concern, increased motor vehicle and train volumes could change this);
  - Elimination of certain motor vehicle conflicts with the closing of the intersections of Coleraine Drive with Elwood Drive West and Old Elwood Drive;
  - Improved truck network and, consequently, increased reliability for the goods movement corridor (fewer delays and reduced exposure to collisions); and
  - The associated reconstruction of Coleraine Drive provides an opportunity to provide bicycle facilities and to upgrade pedestrian facilities to meet current accessibility standards.
- + A by-product of providing grade separation on Coleraine Drive is the redirection of traffic from its minor intersections with Elwood Drive West and Old Elwood Drive to the intersections of Coleraine Drive and King Street West/Harvest Moon Drive and King Street West and Station Road.

The decision with respect to whether the grade separation will be constructed or not will be subject to the next stages of the EA process and budgeting. As such, **Table 18** provides a list of recommended improvements that can address issues identified during the completion of this Transportation Report. It should be noted that these recommendations are not final, and are still subject to discussion with other stakeholders as part of the EA process.

**Table 18 – Transportation Improvements with and without Grade Separation**

Improvement	With Grade Separation	Without Grade Separation
<b>Traffic Operations</b>		
Coordinate the traffic signal at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive with the railway signals/gates to prevent queues from reaching the former	N/A	<input checked="" type="checkbox"/>
Extend storage lengths as indicated in Table 12.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Provide dual left-turn lanes in the southbound and westbound approaches at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
At the intersection of King Street West and Station Road/Deer Valley Drive: <ul style="list-style-type: none"> <li>• Provide an exclusive right-turn lane in the eastbound direction, and extend it to Coleraine Drive (merge with the additional southbound left-turn receiving lane);</li> <li>• Provide one additional through lane in the westbound direction, and extend the receiving lane to Coleraine Drive (merge with the eastbound channelized right-turn lane); and</li> <li>• Provide exclusive left-turn signal phase in the northbound approach.</li> </ul>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Provide storage lengths as indicated in Table 14.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Consider the feasibility of converting the intersection of Coleraine Drive and King Street West/Harvest Moon Drive from a signalized intersection to a multi-lane roundabout.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Traffic Safety</b>		
Consider relocating the railway gate structure (increase offset from the road) to improve sight lines.	N/A	<input checked="" type="checkbox"/>
Provide positive left-turn lane offsets at the intersection of Coleraine Drive and King Street West/Harvest Moon Drive to improve sight lines for left-turning drivers.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Resurface pavement at and on approach to the railway crossing.	Automatically addressed by reconstruction	<input checked="" type="checkbox"/>
Relocate RAILWAY CROSSING AHEAD (Wc-4) warning signs in accordance with OTM Book 6 guidance.	N/A	<input checked="" type="checkbox"/>
Remove the Wc-2A signs in advance of Coleraine and King/Harvest Moon.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Implement a uniform speed limit on King Street West between Coleraine Drive and Station Road.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

B000738



Improvement	With Grade Separation	Without Grade Separation
As part of the design efforts, review clear zone requirements and embankment hazard protection warrants for the bodies of water located at the southwest quadrants of Coleraine Drive and Harvest Moon Drive, and Station Road and King Street West; install guide rails as required.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
All required guide rails within the study area should be installed either flush with the barrier curb or not closer than 2.5 metres from the barrier curb (4.0 metres desirable if design speed is greater than 70 km/h), and energy attenuator end treatments should not be used with barrier curb.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Consider adding an exclusive right-turn lane on Old Ellwood Drive, and providing a raised median island on Coleraine Drive, immediately south of Elwood Drive West.	N/A	<input checked="" type="checkbox"/>
Consider providing pedestrian crossing facilities at the railway.	N/A	<input checked="" type="checkbox"/>
Upgrade pedestrian signal pushbuttons at all intersections in the study area to meet AODA requirements.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Consider modifying the vertical profile of Coleraine Drive in the vicinity of Holland Drive to ensure turning sight distances at all accesses meet design guidelines.	N/A	<input checked="" type="checkbox"/>
<b>Active Transportation</b>		
Consider providing sidewalks along Coleraine Drive through the entire study area (refer to Section 6.3 for further details, including bicycle facilities).	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Provide buffered or separated bicycle lanes on both sides Coleraine Drive, per Bolton Transportation Master Plan; desirable bicycle lane width is 1.8 metres, per OTM Book 18.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Access Management</b>		
Carefully review coordinated operations between Holland Drive and Manchester Court to estimate efficient progression along Coleraine Drive.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Provide a centre left-turn lane along Coleraine Drive between Holland Drive and the relocated Manchester Court; the centre left-turn lane should be converted into exclusive left turn lanes at the approaches to the intersections.	<input checked="" type="checkbox"/>	<input type="checkbox"/>



# APPENDIX A

## Turning Movement Counts

B000738



## TMC - Intersection Count Summary

**Company name:** Trans-Plan Inc.  
**Company address:** 24 Ryerson Avenue, Suite 211, Toronto, Ontario, Canada  
**Company phone:** (647) 931-7383

**Site:** 00903381  
**Location:** King Street at Coleraine Drive / Harvest Moon Drive, Caledon  
**N/S Street:** Coleraine Drive / Harvest Moon Drive  
**E/W Street:** King Street  
**GPS Coordinates:** 43.871948, -79.752320  
**Date:** 10 February 2016  
**Day of week:** Wednesday  
**Analyst(s):** Doug Barr

### VEHICLE TRAFFIC

Interval	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
10/02/2016 07:00	29	61	0	90	35	10	32	77	17	14	15	46	5	14	61	80	293
10/02/2016 07:15	26	93	1	120	57	5	42	104	10	31	10	51	0	18	87	105	380
10/02/2016 07:30	30	81	1	112	42	5	56	103	11	26	16	53	2	21	95	118	386
10/02/2016 07:45	40	100	2	142	49	10	46	105	9	34	17	60	2	28	96	126	433
Hourly Total	125	335	4	464	183	30	176	389	47	105	58	210	9	81	339	429	1492
10/02/2016 08:00	41	94	1	136	53	15	42	110	13	16	18	47	0	29	86	115	408
10/02/2016 08:15	32	87	2	121	54	13	28	95	14	26	16	56	1	16	83	100	372
10/02/2016 08:30	32	76	0	108	44	10	40	94	16	35	9	60	1	16	59	76	338
10/02/2016 08:45	37	81	0	118	34	13	35	82	27	34	10	71	2	12	37	51	322
Hourly Total	142	338	3	483	185	51	145	381	70	111	53	234	4	73	265	342	1440
10/02/2016 09:00	1	2	0	3	7	3	6	16	0	2	1	3	0	0	2	2	24
10/02/2016 09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	1	2	0	3	7	3	6	16	0	2	1	3	0	0	2	2	24
Grand Total	268	675	7	950	375	84	327	786	117	218	112	447	13	154	606	773	2956
Approach %	28	71	1	100	48	11	42	101	26	49	25	100	2	20	78	100	-
Total %	9	23	0	32	13	3	11	27	4	7	4	15	0	5	21	26	-

#### AM Peak Hour 7:15 AM - 8:15 AM

Vehicle Total	137	368	5	510	201	35	186	422	43	107	61	211	4	96	364	464	1607
Car	131	319	5	455	196	33	182	411	42	78	57	177	3	88	361	452	1495
Truck	6	49	0	55	5	2	4	11	1	29	4	34	1	8	3	12	112
Bicycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Interval	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
10/02/2016 11:00	18	38	0	56	3	4	17	24	19	32	10	61	0	7	14	21	162
10/02/2016 11:15	22	41	0	63	5	8	17	30	18	19	16	53	1	6	21	28	174
10/02/2016 11:30	22	34	2	58	9	7	18	34	20	27	5	52	1	8	30	39	183
10/02/2016 11:45	15	29	0	44	8	12	26	46	27	28	15	70	0	7	17	24	184
Hourly Total	77	142	2	221	25	31	78	134	84	106	46	236	2	28	82	112	703
10/02/2016 12:00	17	27	0	44	4	7	18	29	29	34	7	70	1	11	24	36	179
10/02/2016 12:15	21	36	0	57	7	6	15	28	22	39	20	81	0	7	22	29	195
10/02/2016 12:30	24	26	2	52	8	8	23	39	31	43	17	91	0	6	24	30	212
10/02/2016 12:45	25	32	0	57	8	14	17	39	21	30	5	56	0	9	21	30	182
Hourly Total	87	121	2	210	27	35	73	135	103	146	49	298	1	33	91	125	768
10/02/2016 13:00	19	35	1	55	14	11	41	66	34	46	8	88	1	6	24	31	240
10/02/2016 13:15	15	33	0	48	12	8	23	43	18	32	6	56	0	7	18	25	172
10/02/2016 13:30	22	36	0	58	13	4	31	48	24	27	16	67	0	5	19	24	197
10/02/2016 13:45	20	37	0	57	12	8	17	37	19	27	13	59	2	5	18	25	178
Hourly Total	76	141	1	218	51	31	112	194	95	132	43	270	3	23	79	105	787
10/02/2016 14:00	2	4	0	6	0	0	0	0	1	1	0	2	0	0	1	1	9
10/02/2016 14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	2	4	0	6	0	0	0	0	1	1	0	2	0	0	1	1	9
Grand Total	242	408	5	655	103	97	263	463	283	385	138	806	6	84	253	343	2267
Approach %	37	62	1	100	22	21	57	100	35	48	17	100	2	24	74	100	-
Total %	11	18	0	29	5	4	12	21	12	17	6	35	0	4	11	15	-

**Midday Peak Hour 12:15 PM - 1:15 PM**

Vehicle Total	89	129	3	221	37	39	96	172	108	158	50	316	1	28	91	120	829
Car	88	91	3	182	36	39	93	168	108	112	49	269	1	28	90	119	738
Truck	1	38	0	39	1	0	3	4	0	46	1	47	0	0	1	1	91
Bicycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Interval	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
10/02/2016 15:00	25	20	0	45	10	23	34	67	42	65	36	143	1	12	29	42	297
10/02/2016 15:15	23	35	2	60	20	18	35	73	64	84	21	169	2	5	22	29	331
10/02/2016 15:30	31	35	0	66	17	24	36	77	59	97	43	199	1	7	25	33	375
10/02/2016 15:45	34	34	2	70	10	10	42	62	60	82	23	165	1	21	50	72	369
Hourly Total	113	124	4	241	57	75	147	279	225	328	123	676	5	45	126	176	1372
10/02/2016 16:00	45	37	3	85	16	31	33	80	58	96	41	195	3	14	33	50	410
10/02/2016 16:15	41	44	3	88	17	20	37	74	72	84	26	182	0	8	26	34	378
10/02/2016 16:30	42	26	0	68	8	16	35	59	69	112	52	233	1	7	33	41	401
10/02/2016 16:45	33	37	1	71	14	22	43	79	91	109	39	239	0	14	37	51	440
Hourly Total	161	144	7	312	55	89	148	292	290	401	158	849	4	43	129	176	1629
10/02/2016 17:00	42	31	3	76	16	24	56	96	90	109	54	253	1	15	25	41	466
10/02/2016 17:15	51	33	1	85	11	30	46	87	96	88	37	221	1	6	40	47	440
10/02/2016 17:30	38	32	4	74	14	18	44	76	86	92	34	212	4	13	46	63	425
10/02/2016 17:45	39	30	1	70	10	25	48	83	80	65	32	177	1	18	41	60	390
Hourly Total	170	126	9	305	51	97	194	342	352	354	157	863	7	52	152	211	1721
10/02/2016 18:00	3	1	0	4	0	0	2	2	7	6	1	14	0	0	0	0	20
10/02/2016 18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	3	1	0	4	0	0	2	2	7	6	1	14	0	0	0	0	20
Grand Total	447	395	20	862	163	261	491	915	874	1089	439	2402	16	140	407	563	4742
Approach %	52	46	2	100	18	29	54	101	36	45	18	99	3	25	72	100	-
Total %	9	8	0	17	3	6	10	19	18	23	9	50	0	3	9	12	-

PM Peak Hour 4:45 PM - 5:45 PM

Vehicle Total	164	133	9	306	55	94	189	338	363	398	164	925	6	48	148	202	1771
Car	162	102	8	272	55	93	187	335	363	371	163	897	6	48	147	201	1705
Truck	2	31	0	33	0	0	2	2	0	27	1	28	0	0	0	0	63
Bicycle	0	0	1	1	0	1	0	1	0	0	0	0	0	0	1	1	3

# PEDESTRIAN CROSSING

No pedestrian crossing for AM.

10/02/2016 11:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 11:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 11:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 11:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 12:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 12:15:00	0	0	0	1	0	1	0	0	0	0	0	0	1
10/02/2016 12:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 12:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	1	0	1	0	0	0	0	0	0	1
10/02/2016 13:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 13:15:00	0	0	0	1	0	1	0	0	0	0	0	0	1
10/02/2016 13:30:00	0	0	0	1	0	1	0	0	0	0	0	0	1
10/02/2016 13:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	2	0	2	0	0	0	0	0	0	2
10/02/2016 14:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 14:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	3	0	3	0	0	0	0	0	0	3

## Midday Peak Hour 12:45 PM - 1:45 PM

Pedestrians	0	0	0	2	0	2	0	0	0	0	0	0	2
-------------	---	---	---	---	---	---	---	---	---	---	---	---	---

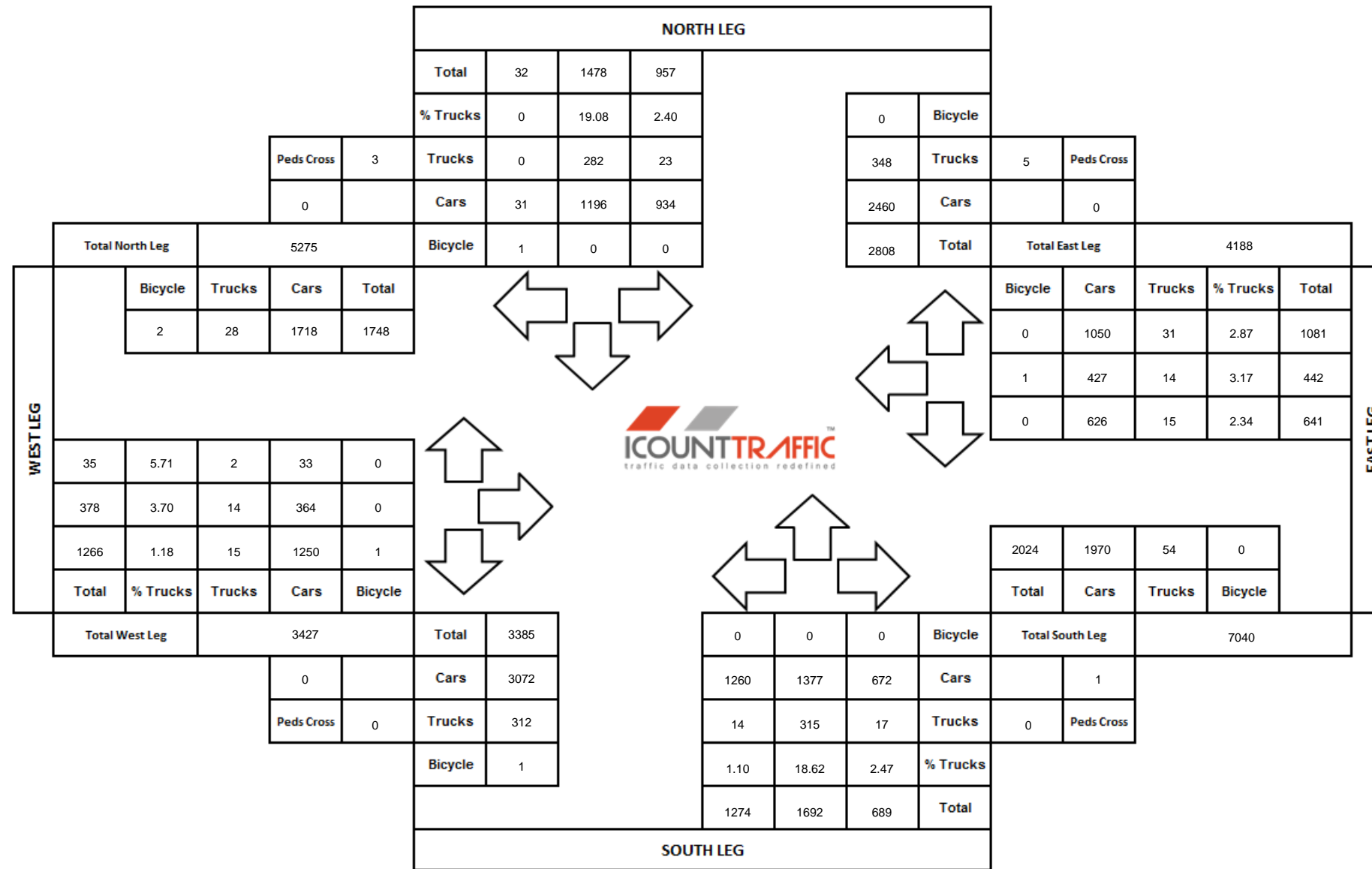
	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
10/02/2016 15:00:00	0	1	1	0	0	0	0	0	0	0	0	0	1
10/02/2016 15:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 15:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 15:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	1	1	0	0	0	0	0	0	0	0	0	1
10/02/2016 16:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 16:15:00	0	1	1	0	0	0	0	0	0	0	0	0	1
10/02/2016 16:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 16:45:00	0	1	1	0	0	0	0	0	0	0	0	0	1
Hourly Total	0	2	2	0	0	0	0	0	0	0	0	0	2
10/02/2016 17:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 17:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 17:30:00	0	1	1	0	0	0	0	0	0	0	0	0	1
10/02/2016 17:45:00	0	1	1	0	0	0	0	0	0	0	1	1	2
Hourly Total	0	2	2	0	0	0	0	0	0	0	1	1	3
10/02/2016 18:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10/02/2016 18:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	5	5	0	0	0	0	0	0	0	1	1	6

## PM Peak Hour 5:00 PM - 6:00 PM

Pedestrians	0	2	2	0	0	0	0	0	0	0	1	1	3
-------------	---	---	---	---	---	---	---	---	---	---	---	---	---

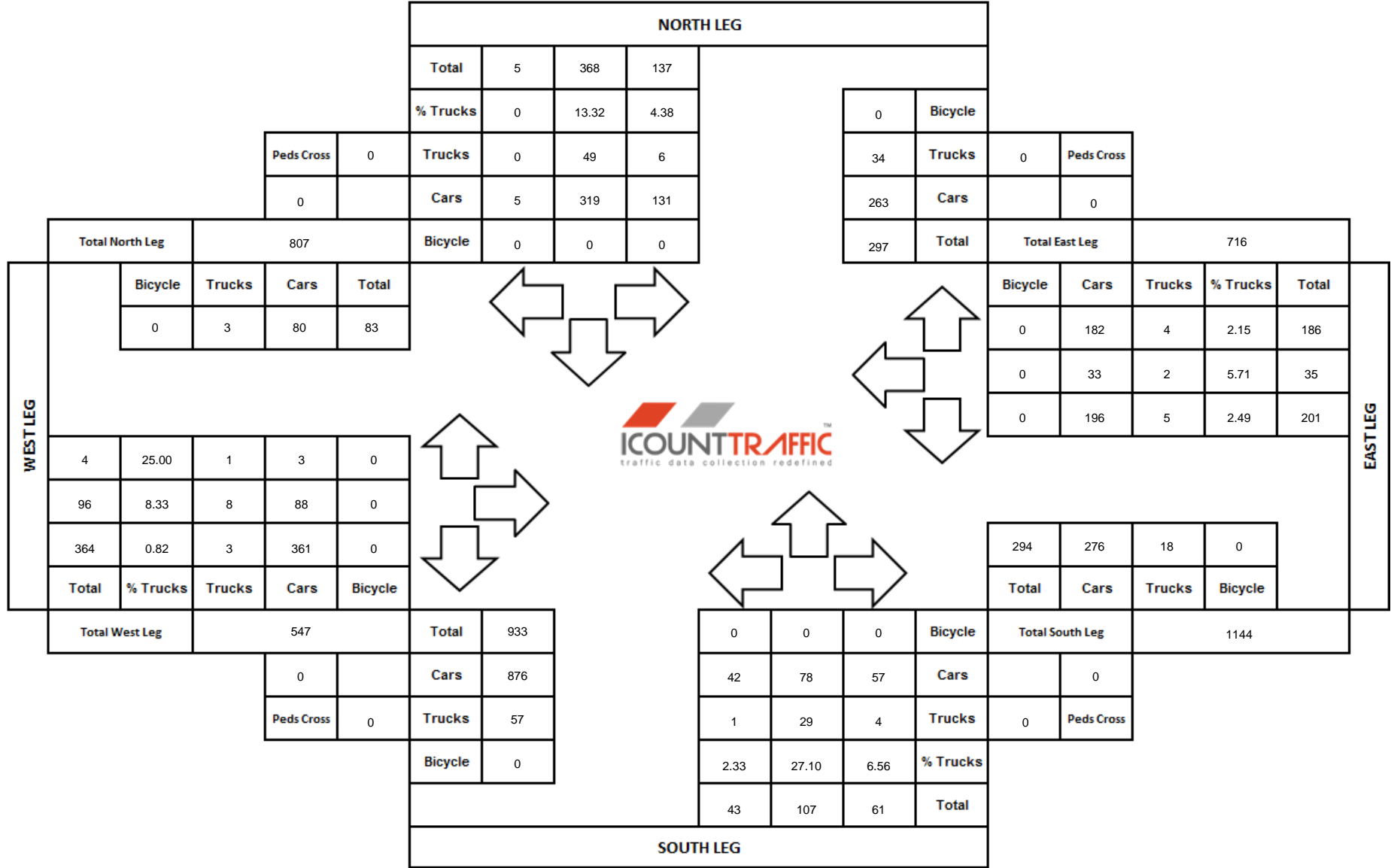
# TOTAL TMC COUNT DIAGRAM

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive / Harvest Moon Drive	Count Date:	10/02/2016
East/West Street:	King Street	Count Period:	AM, Noon, PM
GPS Coordinates:	43.871948, -79.752320	Peak Period:	7:15 AM - 8:15 AM, 12:15 PM - 1:15 PM, 4:45 PM - 5:45 PM
Site Number:	00903381	Major Road:	King Street
Control:	Signalized	Surveyor:	Doug Barr



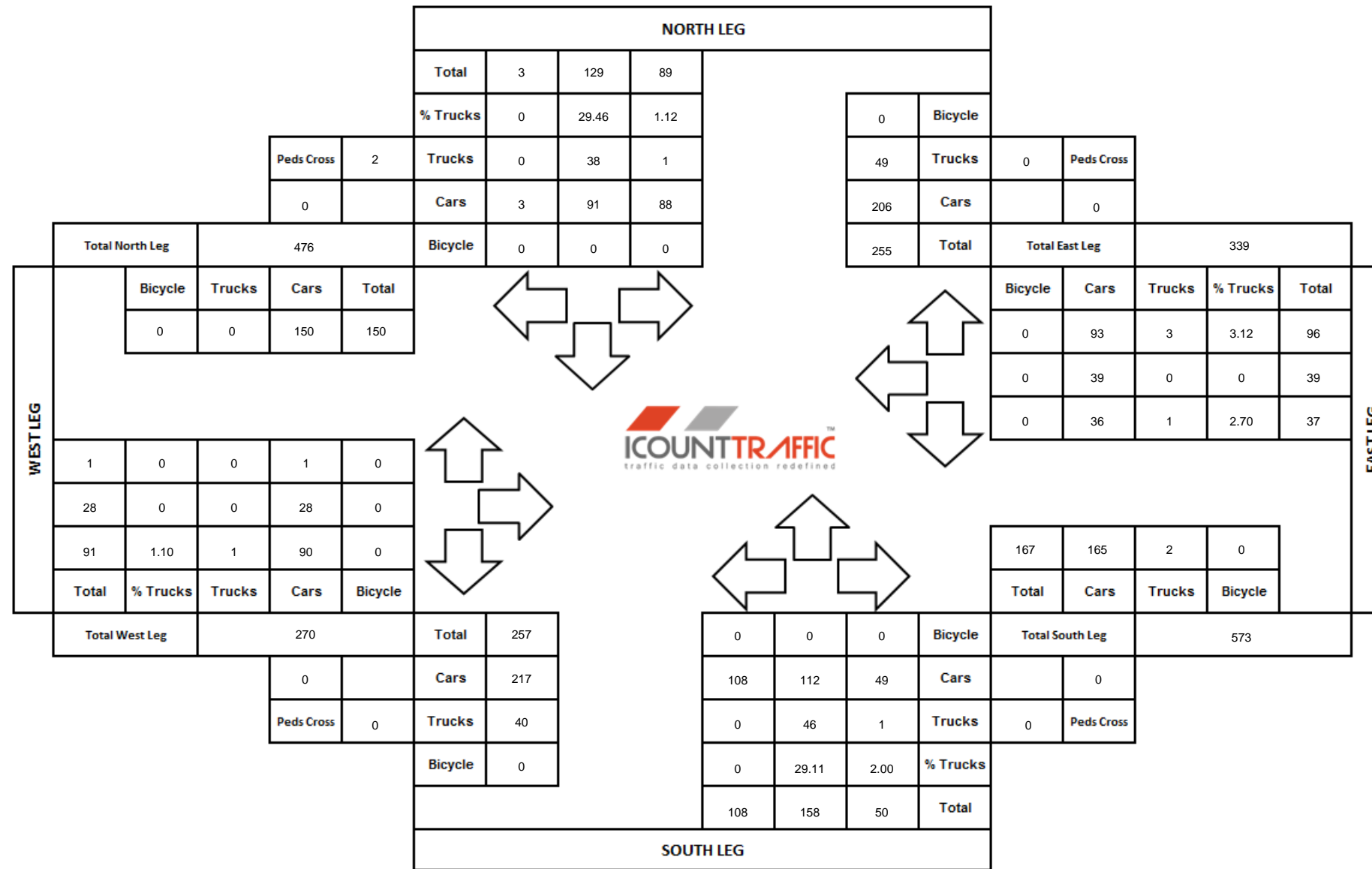
# AM Peak Hour Count Diagram

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive / Harvest Moon Drive	Count Date:	10/02/2016
East/West Street:	King Street	Count Period:	AM
GPS Coordinates:	43.871948, -79.752320	Peak Period:	7:15 AM - 8:15 AM
Site Number:	00903381	Major Road:	King Street
Control:	Signalized	Surveyor:	Doug Barr



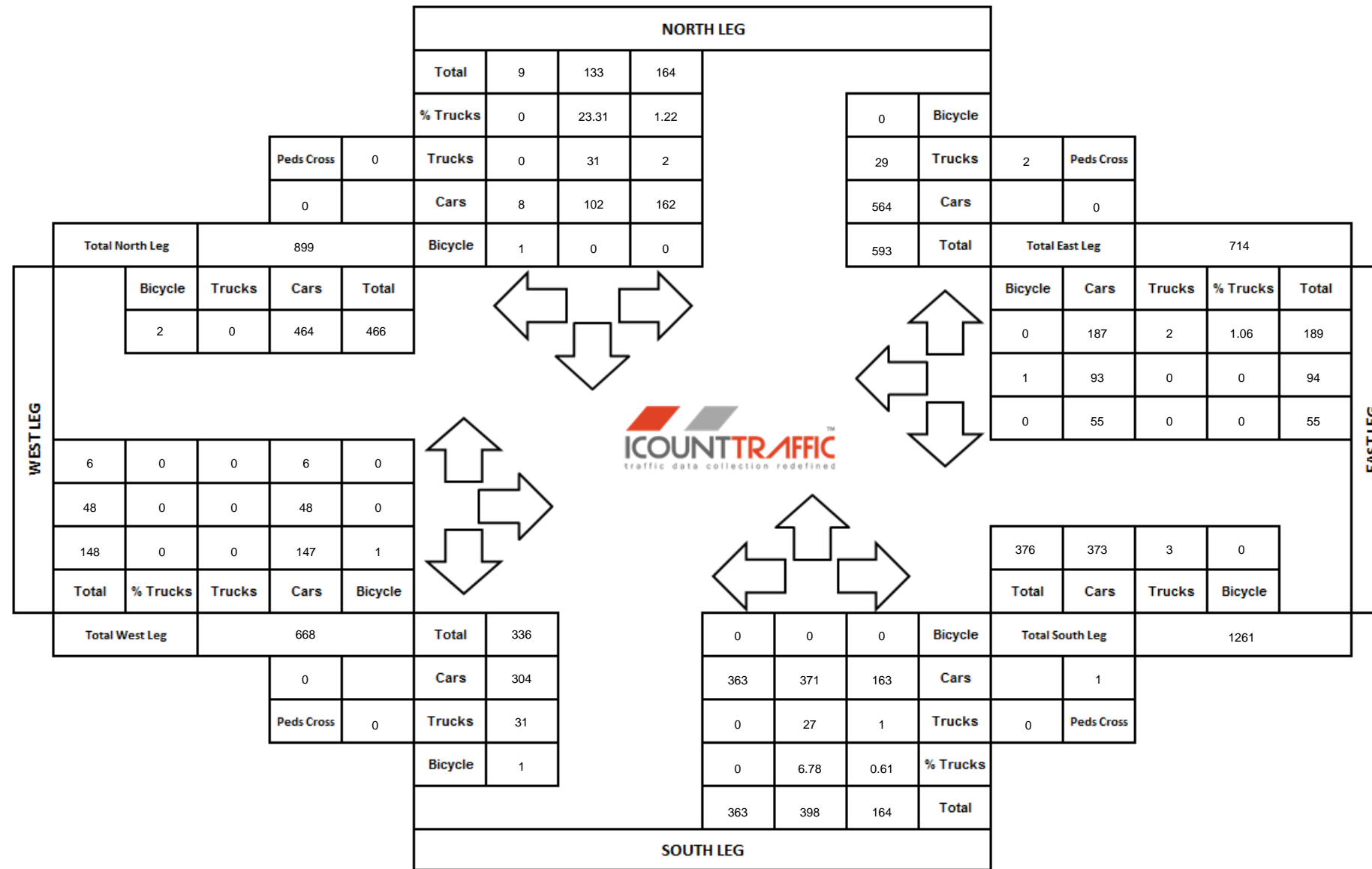
# Noon Peak Hour Count Diagram

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive / Harvest Moon Drive	Count Date:	10/02/2016
East/West Street:	King Street	Count Period:	Noon
GPS Coordinates:	43.871948, -79.752320	Peak Period:	12:15 PM - 1:15 PM
Site Number:	00903381	Major Road:	King Street
Control:	Signalized	Surveyor:	Doug Barr

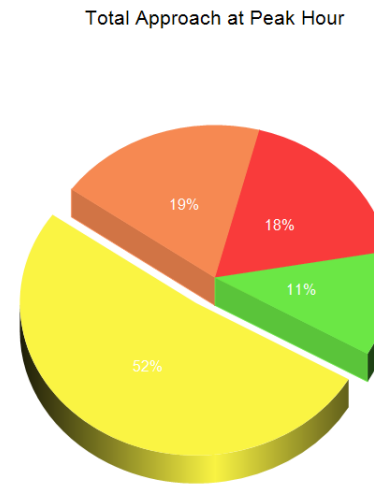
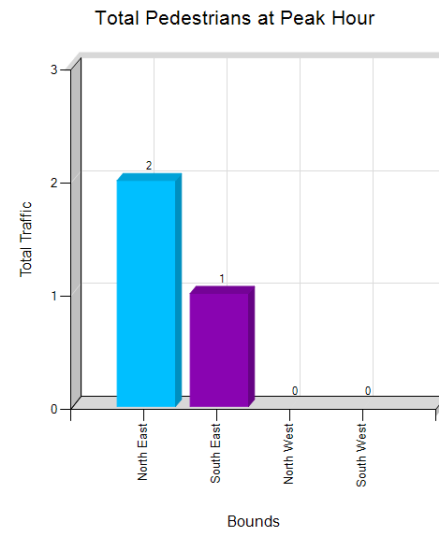
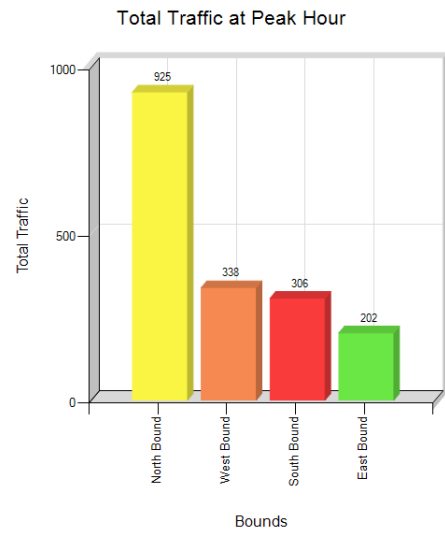
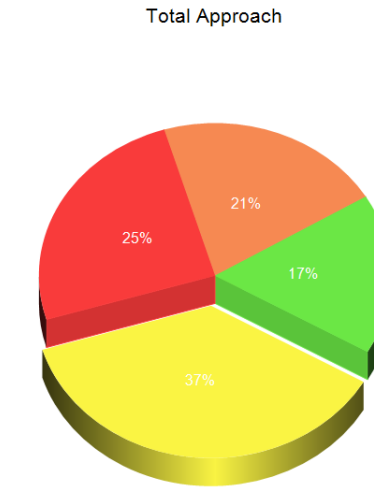
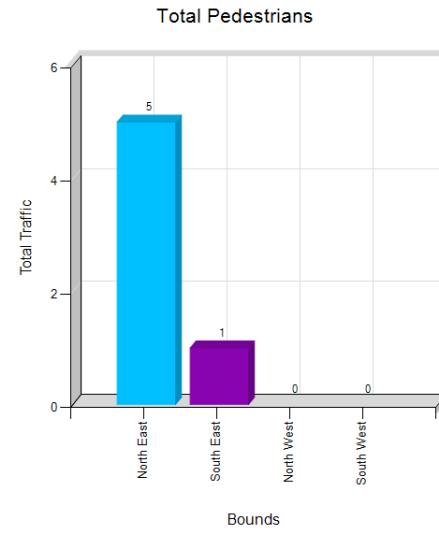
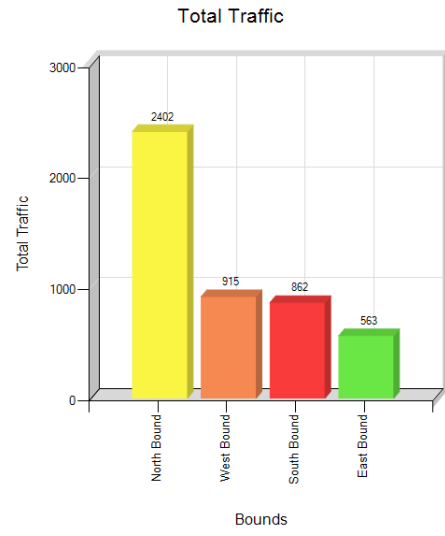


# PM Peak Hour Count Diagram

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive / Harvest Moon Drive	Count Date:	10/02/2016
East/West Street:	King Street	Count Period:	PM
GPS Coordinates:	43.871948, -79.752320	Peak Period:	4:45 PM - 5:45 PM
Site Number:	00903381	Major Road:	King Street
Control:	Signalized	Surveyor:	Doug Barr



# TMC chart data



SouthBound	NorthEast
WestBound	NorthWest
NorthBound	SouthWest
EastBound	SouthEast



NOTES & IMAGES



Emil Kolb Northbound



King Street Eastbound



Coleraine Drive Southbound



Harvest Moon Drive Westbound

# Coleraine Dr @ Ellwood Dr

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00  
**To:** 10:00:00

### One Hour Peak

**From:** 7:30:00  
**To:** 8:30:00

**Municipality:** Bolton  
**Site #:** 000000001  
**Intersection:** Coleraine Dr & Ellwood Dr  
**TFR File #:** 2  
**Count date:** 2-Feb-2017

**Weather conditions:**  
Cloudy/Dry  
**Person(s) who counted:**  
Waldek

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Coleraine Dr runs N/S

North Leg Total: 1122  
North Entering: 942  
North Peds: 0  
Peds Cross:  $\times$

Heavys	28	3	31
Trucks	40	0	40
Cars	866	5	871
<b>Totals</b>	<b>934</b>	<b>8</b>	

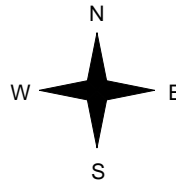


Heavys	24
Trucks	25
Cars	131
<b>Totals</b>	<b>180</b>

East Leg Total: 92  
East Entering: 82  
East Peds: 0  
Peds Cross:  $\times$



Coleraine Dr



	Cars	Trucks	Heavys	Totals
Left Turn	22	1	0	23
Through/Right Turn	58	1	0	59
<b>Totals</b>	<b>80</b>	<b>2</b>	<b>0</b>	

Ellwood Dr



	Cars	Trucks	Heavys	Totals
Through/Right Turn	7	0	3	10

Cars	924
Trucks	41
Heavys	28
<b>Totals</b>	<b>993</b>



Coleraine Dr

Cars	109	2	111
Trucks	24	0	24
Heavys	24	0	24
<b>Totals</b>	<b>157</b>	<b>2</b>	

Peds Cross:  $\times$   
South Peds: 0  
South Entering: 159  
South Leg Total: 1152

## Comments

# Coleraine Dr @ Ellwood Dr

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:30:00

**To:** 17:30:00

**Municipality:** Bolton  
**Site #:** 000000001  
**Intersection:** Coleraine Dr & Ellwood Dr  
**TFR File #:** 2  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Waldek

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Coleraine Dr runs N/S

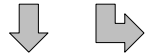
North Leg Total: 1439  
 North Entering: 333  
 North Peds: 0  
 Peds Cross:  $\times$

Heavys	36	1	37
Trucks	13	0	13
Cars	261	22	283
<b>Totals</b>	<b>310</b>	<b>23</b>	

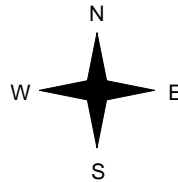


Heavys	22
Trucks	41
Cars	1043
<b>Totals</b>	<b>1106</b>

East Leg Total: 116  
 East Entering: 31  
 East Peds: 0  
 Peds Cross:  $\times$



Coleraine Dr



	Cars	Trucks	Heavys	Totals
Upward arrow	14	0	0	14
Downward arrow	17	0	0	17
<b>Totals</b>	<b>31</b>	<b>0</b>	<b>0</b>	

Ellwood Dr



	Cars	Trucks	Heavys	Totals
Rightward arrow	80	4	1	85

Cars	278
Trucks	13
Heavys	36
<b>Totals</b>	<b>327</b>



Coleraine Dr

Cars	1029	58	1087
Trucks	41	4	45
Heavys	22	0	22
<b>Totals</b>	<b>1092</b>	<b>62</b>	

Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 1154  
 South Leg Total: 1481

## Comments

# Coleraine Dr @ Ellwood Dr

## Total Count Diagram

**Municipality:** Bolton  
**Site #:** 000000001  
**Intersection:** Coleraine Dr & Ellwood Dr  
**TFR File #:** 2  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Waldek

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Coleraine Dr runs N/S

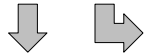
North Leg Total: 6495  
 North Entering: 3265  
 North Peds: 4  
 Peds Cross:  $\times$

Heavys	171	6	177
Trucks	150	3	153
Cars	2848	87	2935
<b>Totals</b>	<b>3169</b>	<b>96</b>	

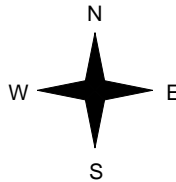


Heavys	171
Trucks	185
Cars	2874
<b>Totals</b>	<b>3230</b>

East Leg Total: 550  
 East Entering: 280  
 East Peds: 1  
 Peds Cross:  $\times$



Coleraine Dr



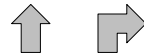
	Cars	Trucks	Heavys	Totals
	105	2	9	116
	160	3	1	164
	265	5	10	

Ellwood Dr



	Cars	Trucks	Heavys	Totals
	251	12	7	270

Coleraine Dr



Cars	3008	Cars	2769	164	2933
Trucks	153	Trucks	183	9	192
Heavys	172	Heavys	162	1	163
<b>Totals</b>	<b>3333</b>	<b>Totals</b>	<b>3114</b>	<b>174</b>	

Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 3288  
 South Leg Total: 6621

### Comments

# Coleraine Dr @ Old Ellwood Dr

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00  
**To:** 10:00:00

### One Hour Peak

**From:** 7:30:00  
**To:** 8:30:00

**Municipality:** Bolton  
**Site #:** 000000002  
**Intersection:** Coleraine Dr & Old Ellwood Dr  
**TFR File #:** 5  
**Count date:** 2-Feb-2017

**Weather conditions:**  
Cloudy/Dry  
**Person(s) who counted:**  
Bronek

**\*\* Signalized Intersection \*\***

**Major Road:** Coleraine Dr runs N/S

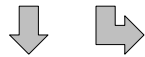
North Leg Total: 1139  
North Entering: 979  
North Peds: 0  
Peds Cross:  $\times$

Heavys	28	1	29
Trucks	8	4	12
Cars	798	140	938
<b>Totals</b>	<b>834</b>	<b>145</b>	

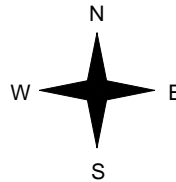


Heavys	24
Trucks	16
Cars	120
<b>Totals</b>	<b>160</b>

East Leg Total: 260  
East Entering: 88  
East Peds: 0  
Peds Cross:  $\times$



Coleraine Dr



	Cars	Trucks	Heavys	Totals
	39	3	2	44
	42	0	2	44
	81	3	4	

Old Ellwood Dr



	Cars	Trucks	Heavys	Totals
	165	5	2	172

Cars	840
Trucks	8
Heavys	30
<b>Totals</b>	<b>878</b>



Coleraine Dr

Cars	81	25	106
Trucks	13	1	14
Heavys	22	1	23
<b>Totals</b>	<b>116</b>	<b>27</b>	

Peds Cross:  $\times$   
South Peds: 0  
South Entering: 143  
South Leg Total: 1021

## Comments

# Coleraine Dr @ Old Ellwood Dr

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:30:00

**To:** 17:30:00

**Municipality:** Bolton  
**Site #:** 0000000002  
**Intersection:** Coleraine Dr & Old Ellwood Dr  
**TFR File #:** 5  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Bronek

**\*\* Signalized Intersection \*\***

**Major Road:** Coleraine Dr runs N/S

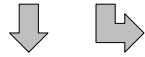
North Leg Total: 1457  
 North Entering: 320  
 North Peds: 0  
 Peds Cross:  $\times$

Heavys	38	0	38
Trucks	2	0	2
Cars	193	87	280
<b>Totals</b>	<b>233</b>	<b>87</b>	

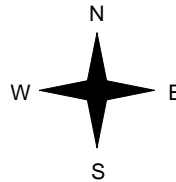


Heavys	20
Trucks	13
Cars	1104
<b>Totals</b>	<b>1137</b>

East Leg Total: 432  
 East Entering: 261  
 East Peds: 0  
 Peds Cross:  $\times$



Coleraine Dr



Cars	Trucks	Heavys	Totals
237	0	0	237
23	1	0	24
<b>260</b>	<b>1</b>	<b>0</b>	

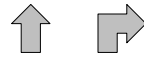


Old Ellwood Dr



Cars	Trucks	Heavys	Totals
170	0	1	171

Coleraine Dr



Cars	216	Cars	867	83	950
Trucks	3	Trucks	13	0	13
Heavys	38	Heavys	20	1	21
<b>Totals</b>	<b>257</b>	<b>Totals</b>	<b>900</b>	<b>84</b>	



Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 984  
 South Leg Total: 1241

## Comments

# Coleraine Dr @ Old Ellwood Dr

## Total Count Diagram

**Municipality:** Bolton  
**Site #:** 0000000002  
**Intersection:** Coleraine Dr & Old Ellwood Dr  
**TFR File #:** 5  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Bronek

**\*\* Signalized Intersection \*\***

**Major Road:** Coleraine Dr runs N/S

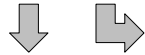
North Leg Total: 6540  
 North Entering: 3280  
 North Peds: 2  
 Peds Cross:  $\times$

Heavys	162	8	170
Trucks	46	10	56
Cars	2451	603	3054
<b>Totals</b>	<b>2659</b>	<b>621</b>	

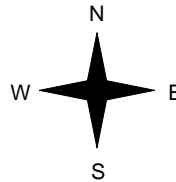


Heavys	163
Trucks	72
Cars	3025
<b>Totals</b>	<b>3260</b>

East Leg Total: 1775  
 East Entering: 874  
 East Peds: 1  
 Peds Cross:  $\times$



Coleraine Dr



	Cars	Trucks	Heavys	Totals
	690	15	12	717
	150	5	2	157
	840	20	14	

Old Ellwood Dr



	Cars	Trucks	Heavys	Totals
	875	16	10	901

Cars	2601
Trucks	51
Heavys	164
<b>Totals</b>	<b>2816</b>



Coleraine Dr

Cars	2335	272	2607
Trucks	57	6	63
Heavys	151	2	153
<b>Totals</b>	<b>2543</b>	<b>280</b>	

Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 2823  
 South Leg Total: 5639

### Comments



# King St W @ Deer Valley Dr / Station Rd

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00  
**To:** 10:00:00

### One Hour Peak

**From:** 7:15:00  
**To:** 8:15:00

**Municipality:** Bolton  
**Site #:** 000000004  
**Intersection:** King St W & Station Rd  
**TFR File #:** 3  
**Count date:** 2-Feb-2017

**Weather conditions:**  
Cloudy/Dry  
**Person(s) who counted:**  
Ola

**\*\* Signalized Intersection \*\***

**Major Road:** King St W runs W/E

North Leg Total: 79  
North Entering: 69  
North Peds: 2  
Peds Cross:  $\times$

Heavys	1	0	0	1
Trucks	0	1	0	1
Cars	41	8	18	67
Totals	42	9	18	



Heavys	1
Trucks	0
Cars	9
Totals	10

East Leg Total: 530  
East Entering: 294  
East Peds: 0  
Peds Cross:  $\times$

Heavys	4
Trucks	9
Cars	314
Totals	327

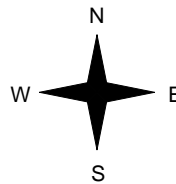


Deer Valley Dr

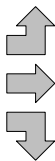
Cars	3	0	0	3
Trucks	270	9	3	282
Heavys	8	0	1	9
Totals	281	9	4	



King St W



Heavys	0
Trucks	0
Cars	2
Totals	2
Heavys	0
Trucks	8
Cars	185
Totals	193
Heavys	1
Trucks	0
Cars	4
Totals	5
Heavys	1
Trucks	8
Cars	191
Totals	



King St W



Peds Cross:  $\times$   
West Peds: 0  
West Entering: 200  
West Leg Total: 527

Cars	20
Trucks	1
Heavys	2
Totals	23



Station Rd

Cars	3	4	25	32
Trucks	0	0	0	0
Heavys	0	1	0	1
Totals	3	5	25	

Peds Cross:  $\times$   
South Peds: 0  
South Entering: 33  
South Leg Total: 56

## Comments

# King St W @ Deer Valley Dr / Station Rd

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 17:00:00

**To:** 18:00:00

**Municipality:** Bolton  
**Site #:** 000000004  
**Intersection:** King St W & Station Rd  
**TFR File #:** 3  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Ola

**\*\* Signalized Intersection \*\***

**Major Road:** King St W runs W/E

North Leg Total: 101  
 North Entering: 34  
 North Peds: 2  
 Peds Cross:  $\bowtie$

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	14	6	14	34
Totals	14	6	14	



Heavys	0
Trucks	1
Cars	66
Totals	67

East Leg Total: 754  
 East Entering: 319  
 East Peds: 0  
 Peds Cross:  $\bowtie$

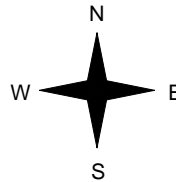
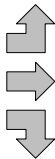
Heavys	0
Trucks	12
Cars	279
Totals	291



Deer Valley Dr

Cars	18	1	0	19
Trucks	254	12	0	266
Heavys	34	0	0	34
Totals	306	13	0	

Heavys	0
Trucks	0
Cars	30
Totals	30
Heavys	1
Trucks	9
Cars	379
Totals	389
Heavys	0
Trucks	1
Cars	12
Totals	13
Heavys	1
Trucks	10
Cars	421
Totals	432



King St W



Cars	425	9	1	435
Trucks				
Heavys				
Totals				

Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 432  
 West Leg Total: 723

Cars	52	11	18	32	61
Trucks	1	0	0	0	0
Heavys	0	0	0	0	0
Totals	53	11	18	32	



Peds Cross:  $\bowtie$   
 South Peds: 0  
 South Entering: 61  
 South Leg Total: 114

## Comments

# King St W @ Deer Valley Dr / Station Rd

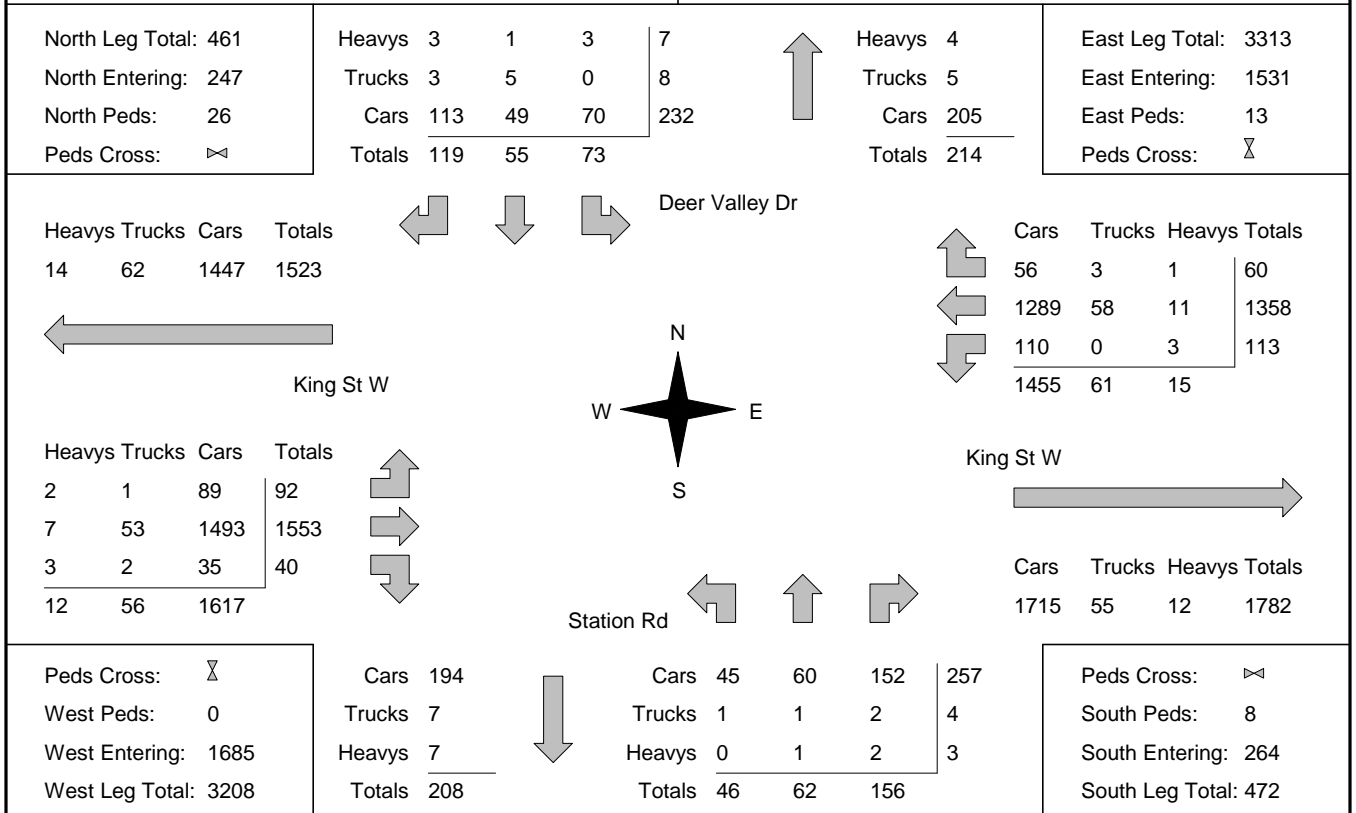
## Total Count Diagram

**Municipality:** Bolton  
**Site #:** 000000004  
**Intersection:** King St W & Station Rd  
**TFR File #:** 3  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Ola

**\*\* Signalized Intersection \*\***

**Major Road:** King St W runs W/E



### Comments

# Station Rd @ Ellwood Dr

## Morning Peak Diagram

### Specified Period

**From:** 7:00:00  
**To:** 10:00:00

### One Hour Peak

**From:** 8:00:00  
**To:** 9:00:00

**Municipality:** Bolton  
**Site #:** 000000003  
**Intersection:** Ellwood Dr & Station Rd  
**TFR File #:** 2  
**Count date:** 2-Feb-2017

**Weather conditions:**  
Cloudy/Dry  
**Person(s) who counted:**  
Teresa

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Ellwood Dr runs W/E

North Leg Total: 119  
North Entering: 91  
North Peds: 0  
Peds Cross:  $\bowtie$

Heavys	1	1	7	9
Trucks	0	0	2	2
Cars	10	0	70	80
Totals	11	1	79	



Heavys	2
Trucks	1
Cars	25
Totals	28

East Leg Total: 346  
East Entering: 106  
East Peds: 0  
Peds Cross:  $\bowtie$

Heavys	6
Trucks	6
Cars	82
Totals	94

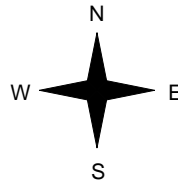


Station Rd

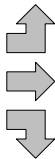
Cars	24	Trucks	1	Heavys	1	Totals	26
Cars	69	Trucks	5	Heavys	4	Totals	78
Cars	0	Trucks	0	Heavys	2	Totals	2
Cars	93	Trucks	6	Heavys	7	Totals	



Old Ellwood Dr



Heavys	1
Trucks	0
Cars	1
Totals	2
Heavys	3
Trucks	9
Cars	148
Totals	160
Heavys	0
Trucks	1
Cars	0
Totals	1
Heavys	4
Trucks	10
Cars	149
Totals	



Ellwood Dr



Driveway



Cars	219	Trucks	11	Heavys	10	Totals	240
------	-----	--------	----	--------	----	--------	-----

Peds Cross:  $\bowtie$   
West Peds: 0  
West Entering: 163  
West Leg Total: 257

Cars	0
Trucks	1
Heavys	3
Totals	4



Cars	3	0	1	4
Trucks	1	0	0	1
Heavys	1	0	0	1
Totals	5	0	1	

Peds Cross:  $\bowtie$   
South Peds: 0  
South Entering: 6  
South Leg Total: 10

## Comments

# Station Rd @ Ellwood Dr

## Afternoon Peak Diagram

### Specified Period

**From:** 15:00:00

**To:** 18:00:00

### One Hour Peak

**From:** 16:30:00

**To:** 17:30:00

**Municipality:** Bolton  
**Site #:** 000000003  
**Intersection:** Ellwood Dr & Station Rd  
**TFR File #:** 2  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Teresa

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Ellwood Dr runs W/E

North Leg Total: 186  
 North Entering: 61  
 North Peds: 0  
 Peds Cross:  $\times$

Heavys	0	0	0	0
Trucks	0	0	0	0
Cars	5	0	56	61
Totals	5	0	56	



Heavys	0
Trucks	0
Cars	125
Totals	125

East Leg Total: 573  
 East Entering: 362  
 East Peds: 0  
 Peds Cross:  $\times$

Heavys	0
Trucks	4
Cars	253
Totals	257

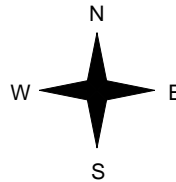


Station Rd

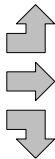
Cars	109	0	0	109
Trucks	248	4	0	252
Heavys	1	0	0	1
Totals	358	4	0	



Old Ellwood Dr



Heavys	0
Trucks	0
Cars	16
Totals	16
Heavys	0
Trucks	3
Cars	151
Totals	154
Heavys	1
Trucks	0
Cars	0
Totals	1
Heavys	1
Trucks	3
Cars	167
Totals	



Ellwood Dr



Peds Cross:  $\times$   
 West Peds: 0  
 West Entering: 171  
 West Leg Total: 428

Cars	1
Trucks	0
Heavys	1
Totals	2



Driveway

Cars	0	0	1	1
Trucks	0	0	0	0
Heavys	0	0	0	0
Totals	0	0	1	

Peds Cross:  $\times$   
 South Peds: 0  
 South Entering: 1  
 South Leg Total: 3

## Comments

# Station Rd @ Ellwood Dr

## Total Count Diagram

**Municipality:** Bolton  
**Site #:** 000000003  
**Intersection:** Ellwood Dr & Station Rd  
**TFR File #:** 2  
**Count date:** 2-Feb-2017

**Weather conditions:**  
 Cloudy/Dry  
**Person(s) who counted:**  
 Teresa

**\*\* Non-Signalized Intersection \*\***

**Major Road:** Ellwood Dr runs W/E

North Leg Total: 829  
 North Entering: 419  
 North Peds: 1  
 Peds Cross:  $\bowtie$

Heavys	1	2	9	12
Trucks	1	0	6	7
Cars	46	0	354	400
Totals	48	2	369	



Heavys	7
Trucks	4
Cars	399
Totals	410

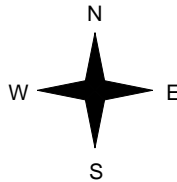
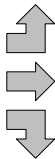
East Leg Total: 2393  
 East Entering: 1173  
 East Peds: 4  
 Peds Cross:  $\bowtie$

Heavys	Trucks	Cars	Totals
16	32	814	862



Old Ellwood Dr

Heavys	Trucks	Cars	Totals
1	0	44	45
5	25	815	845
4	1	1	6
10	26	860	



Driveway

Cars	Trucks	Heavys	Totals
355	4	6	365
763	30	9	802
3	0	3	6
1121	34	18	



Ellwood Dr



Cars	Trucks	Heavys	Totals
1174	31	15	1220

Peds Cross:  $\bowtie$   
 West Peds: 0  
 West Entering: 896  
 West Leg Total: 1758

Cars	4
Trucks	1
Heavys	9
Totals	14



Cars	5	0	5	10
Trucks	1	0	0	1
Heavys	6	0	1	7
Totals	12	0	6	

Peds Cross:  $\bowtie$   
 South Peds: 0  
 South Entering: 18  
 South Leg Total: 32

### Comments



Turning Movement Count (20 . COLERAINE DR & MANCHESTER CT) CustID: 15007550 MiolD: 363875

Start Time	Southbound COLERAINE DR						Westbound PRIVATE ACCESS						Northbound COLERAINE DR						Eastbound MANCHESTER COURT						Int. Total (15 min)	Int. Total (1 hr)
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total		
07:00:00	0	221	1	0	0	222	1	0	0	0	0	1	6	48	0	0	0	54	1	0	11	0	0	12	289	
07:15:00	0	223	5	0	0	228	0	0	0	0	0	0	3	44	0	0	0	47	1	0	2	0	0	3	278	
07:30:00	0	219	11	0	0	230	0	0	0	0	0	0	17	44	0	0	0	61	1	0	1	0	0	2	293	
07:45:00	0	234	19	0	0	253	0	0	0	0	0	0	8	45	0	0	0	53	1	0	3	0	0	4	310	1170
08:00:00	0	196	7	1	0	204	0	0	0	0	0	0	11	47	1	0	0	59	1	0	2	0	0	3	266	1147
08:15:00	0	183	2	0	0	185	1	0	0	0	0	1	5	60	1	0	0	66	0	0	1	0	0	1	253	1122
08:30:00	0	155	7	0	0	162	2	0	0	0	0	2	9	51	1	0	0	61	0	0	2	0	0	2	227	1056
08:45:00	0	145	7	0	0	152	0	0	0	0	0	0	6	41	1	0	0	48	0	0	3	0	0	3	203	949
***BREAK***																										
11:00:00	0	53	0	0	0	53	2	0	0	0	1	2	3	48	0	0	0	51	0	0	6	0	0	6	112	
11:15:00	0	52	1	0	0	53	0	0	0	0	0	0	2	61	0	0	0	63	0	0	8	0	1	8	124	
11:30:00	0	59	0	0	0	59	0	0	0	0	0	0	6	62	0	0	0	68	1	0	4	0	0	5	132	
11:45:00	0	75	0	0	0	75	0	0	1	0	0	1	0	48	1	0	0	49	2	0	3	0	0	5	130	498
12:00:00	0	70	1	0	0	71	1	0	0	0	0	1	7	56	1	0	0	64	3	0	7	0	0	10	146	532
12:15:00	0	66	3	0	0	69	0	0	0	0	0	0	2	67	0	0	0	69	1	0	8	0	0	9	147	555
12:30:00	0	67	5	0	0	72	1	0	0	0	0	1	7	75	0	0	0	82	2	0	5	0	0	7	162	585
12:45:00	0	62	1	0	0	63	0	0	0	0	0	0	4	62	0	0	0	66	1	0	6	0	0	7	136	591
13:00:00	0	63	2	1	0	66	0	0	0	0	0	0	7	80	0	0	0	87	1	0	5	0	0	6	159	604
13:15:00	0	46	0	0	0	46	0	0	0	0	0	0	8	58	0	0	0	66	2	0	5	0	0	7	119	576
13:30:00	0	54	5	0	0	59	0	0	0	0	0	0	8	61	0	0	0	69	5	0	5	0	0	10	138	552
13:45:00	0	62	3	0	0	65	0	0	0	0	0	0	10	57	1	0	0	68	2	0	6	0	0	8	141	557
***BREAK***																										
15:00:00	0	64	0	0	0	64	0	0	0	0	0	0	6	108	0	0	0	114	6	0	29	0	0	35	213	
15:15:00	0	75	1	0	0	76	1	0	0	0	0	1	5	115	1	0	0	121	4	0	5	0	0	9	207	
15:30:00	0	67	0	0	0	67	0	0	0	0	0	0	4	170	1	0	0	175	3	0	6	0	0	9	251	
15:45:00	0	94	3	0	0	97	0	0	0	0	0	0	6	153	2	0	0	161	4	0	4	0	0	8	266	937
16:00:00	0	68	1	0	0	69	0	0	0	0	0	0	3	177	0	0	0	180	4	0	10	0	0	14	263	987
16:15:00	0	71	1	0	0	72	0	0	0	0	0	0	4	183	0	0	0	187	3	0	5	0	0	8	267	1047
16:30:00	0	83	0	0	0	83	0	0	0	0	1	0	1	219	0	0	0	220	6	0	10	0	0	16	319	1115
16:45:00	0	84	0	0	0	84	3	0	0	0	0	3	5	196	0	0	1	201	5	0	7	0	3	12	300	1149
17:00:00	0	62	1	0	0	63	1	0	0	0	1	1	1	287	0	0	0	288	10	0	13	0	0	23	375	1261
17:15:00	1	77	0	0	0	78	0	0	0	0	0	0	5	259	0	0	0	264	7	0	4	0	0	11	353	1347



17:30:00	0	71	1	0	0	72	0	0	1	0	0	1	3	219	0	0	0	222	5	0	6	0	0	11	306	1334
17:45:00	0	82	0	0	0	82	0	0	0	0	0	0	0	203	0	0	0	203	5	0	8	0	0	13	298	1332
<b>Grand Total</b>	<b>1</b>	<b>3203</b>	<b>88</b>	<b>2</b>	<b>0</b>	<b>3294</b>	<b>13</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>3</b>	<b>15</b>	<b>172</b>	<b>3404</b>	<b>11</b>	<b>0</b>	<b>1</b>	<b>3587</b>	<b>87</b>	<b>0</b>	<b>200</b>	<b>0</b>	<b>4</b>	<b>287</b>	<b>7183</b>	<b>-</b>
<b>Approach%</b>	0%	97.2%	2.7%	0.1%	-	86.7%	0%	13.3%	0%	-	4.8%	94.9%	0.3%	0%	-	30.3%	0%	69.7%	0%	-	-	-	-	-	-	-
<b>Totals %</b>	0%	44.6%	1.2%	0%	45.9%	0.2%	0%	0%	0%	0.2%	2.4%	47.4%	0.2%	0%	49.9%	1.2%	0%	2.8%	0%	4%	-	-	-	-	-	-
<b>Heavy</b>	0	346	5	0	-	8	0	0	0	-	67	347	3	0	-	6	0	60	0	-	-	-	-	-	-	-
<b>Heavy %</b>	0%	10.8%	5.7%	0%	-	61.5%	0%	0%	0%	-	39%	10.2%	27.3%	0%	-	6.9%	0%	30%	0%	-	-	-	-	-	-	-
<b>Bicycles</b>	0	2	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-	-	-	-	-	-
<b>Bicycle %</b>	0%	0.1%	0%	0%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	-	-	-	-	-	-





**Peak Hour: 07:00 AM - 08:00 AM Weather: Clear (3.4 °C)**

Start Time	Southbound COLERAINE DR						Westbound PRIVATE ACCESS						Northbound COLERAINE DR						Eastbound MANCHESTER COURT						Int. Total (15 min)
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	
07:00:00	0	221	1	0	0	222	1	0	0	0	0	1	6	48	0	0	0	54	1	0	11	0	0	12	289
07:15:00	0	223	5	0	0	228	0	0	0	0	0	0	3	44	0	0	0	47	1	0	2	0	0	3	278
07:30:00	0	219	11	0	0	230	0	0	0	0	0	0	17	44	0	0	0	61	1	0	1	0	0	2	293
07:45:00	0	234	19	0	0	253	0	0	0	0	0	0	8	45	0	0	0	53	1	0	3	0	0	4	310
<b>Grand Total</b>	0	897	36	0	0	933	1	0	0	0	0	1	34	181	0	0	0	215	4	0	17	0	0	21	1170
<b>Approach%</b>	0%	96.1%	3.9%	0%	-	-	100%	0%	0%	0%	-	15.8%	84.2%	0%	0%	-	19%	0%	81%	0%	-	-	-	-	
<b>Totals %</b>	0%	76.7%	3.1%	0%	79.7%	0.1%	0%	0%	0%	0.1%	2.9%	15.5%	0%	0%	18.4%	0.3%	0%	1.5%	0%	1.8%	-	-	-	-	
<b>PHF</b>	0	0.96	0.47	0	0.92	0.25	0	0	0	0.25	0.5	0.94	0	0	0.88	1	0	0.39	0	0.44	-	-	-	-	
<b>Heavy</b>	0	45	0	0	45	1	0	0	0	1	5	49	0	0	54	0	0	4	0	4	-	-	-	-	
<b>Heavy %</b>	0%	5%	0%	0%	4.8%	100%	0%	0%	0%	100%	14.7%	27.1%	0%	0%	25.1%	0%	0%	23.5%	0%	19%	-	-	-	-	
<b>Lights</b>	0	852	36	0	888	0	0	0	0	0	29	132	0	0	161	4	0	13	0	17	-	-	-	-	
<b>Lights %</b>	0%	95%	100%	0%	95.2%	0%	0%	0%	0%	0%	85.3%	72.9%	0%	0%	74.9%	100%	0%	76.5%	0%	81%	-	-	-	-	
<b>Single-Unit Trucks</b>	0	28	0	0	28	1	0	0	0	1	1	27	0	0	28	0	0	1	0	1	-	-	-	-	
<b>Single-Unit Trucks %</b>	0%	3.1%	0%	0%	3%	100%	0%	0%	0%	100%	2.9%	14.9%	0%	0%	13%	0%	0%	5.9%	0%	4.8%	-	-	-	-	
<b>Buses</b>	0	2	0	0	2	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	-	-	-	-	
<b>Buses %</b>	0%	0.2%	0%	0%	0.2%	0%	0%	0%	0%	0%	0%	2.8%	0%	0%	2.3%	0%	0%	0%	0%	0%	-	-	-	-	
<b>Articulated Trucks</b>	0	15	0	0	15	0	0	0	0	0	4	17	0	0	21	0	0	3	0	3	-	-	-	-	
<b>Articulated Trucks %</b>	0%	1.7%	0%	0%	1.6%	0%	0%	0%	0%	0%	11.8%	9.4%	0%	0%	9.8%	0%	0%	17.6%	0%	14.3%	-	-	-	-	
<b>Pedestrians</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	
<b>Pedestrians%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	
<b>Bicycles on Road</b>	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-	-	-	
<b>Bicycles on Road%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	



**Peak Hour: 12:15 PM - 01:15 PM Weather: Mostly Cloudy (12.2 °C)**

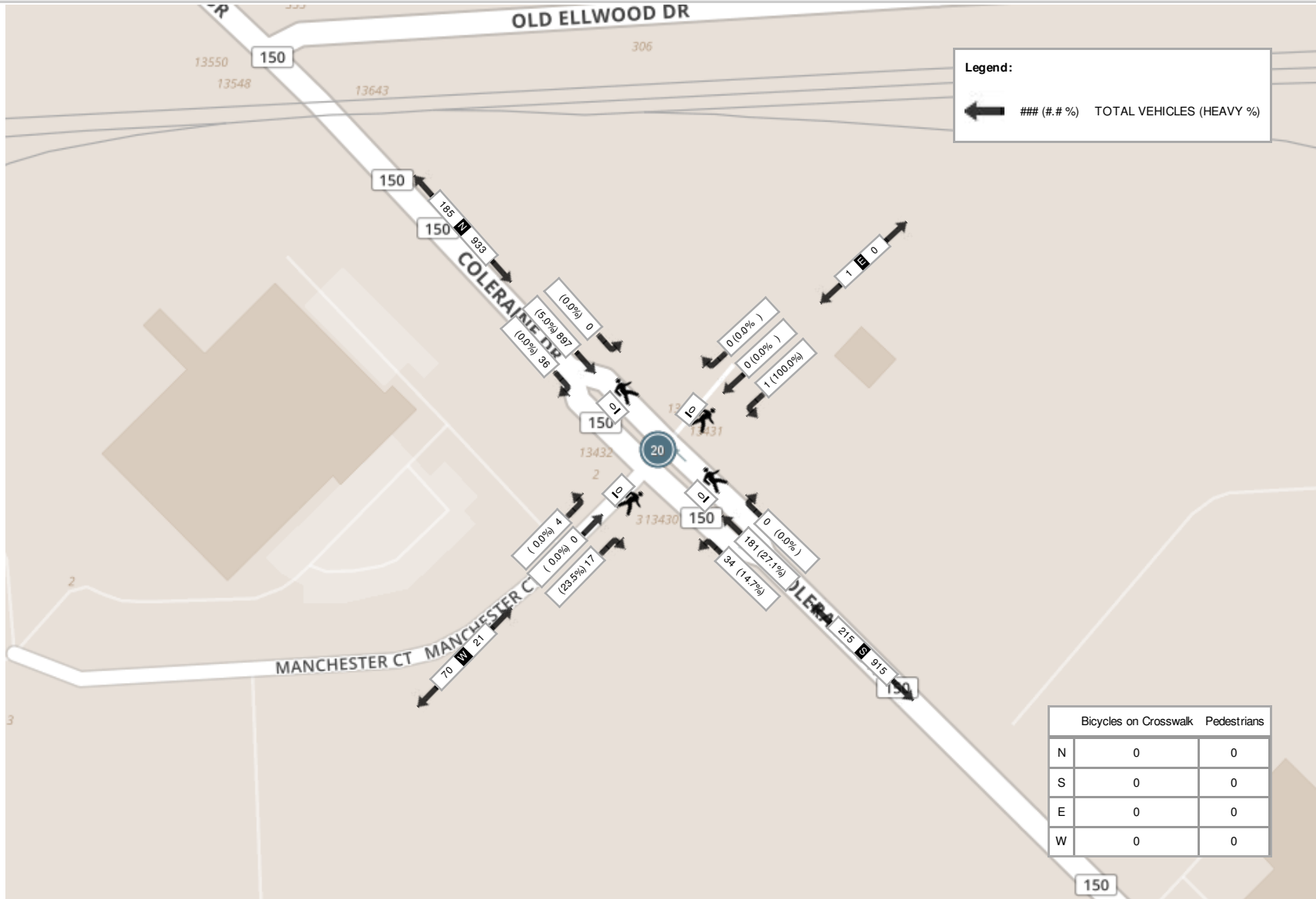
Start Time	Southbound COLERAINE DR						Westbound PRIVATE ACCESS						Northbound COLERAINE DR						Eastbound MANCHESTER COURT						Int. Total (15 min)
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	
12:15:00	0	66	3	0	0	69	0	0	0	0	0	0	2	67	0	0	0	69	1	0	8	0	0	9	147
12:30:00	0	67	5	0	0	72	1	0	0	0	0	1	7	75	0	0	0	82	2	0	5	0	0	7	162
12:45:00	0	62	1	0	0	63	0	0	0	0	0	0	4	62	0	0	0	66	1	0	6	0	0	7	136
13:00:00	0	63	2	1	0	66	0	0	0	0	0	0	7	80	0	0	0	87	1	0	5	0	0	6	159
<b>Grand Total</b>	0	258	11	1	0	270	1	0	0	0	0	1	20	284	0	0	0	304	5	0	24	0	0	29	<b>604</b>
<b>Approach%</b>	0%	95.6%	4.1%	0.4%	-	-	100%	0%	0%	0%	-	6.6%	93.4%	0%	0%	-	17.2%	0%	82.8%	0%	-	-	-	-	
<b>Totals %</b>	0%	42.7%	1.8%	0.2%	44.7%	0.2%	0%	0%	0%	0.2%	3.3%	47%	0%	0%	50.3%	0.8%	0%	4%	0%	4.8%	-	-	-	-	
<b>PHF</b>	0	0.96	0.55	0.25	0.94	0.25	0	0	0	0.25	0.71	0.89	0	0	0.87	0.63	0	0.75	0	0.81	-	-	-	-	
<b>Heavy</b>	0	42	2	0	44	1	0	0	0	1	8	56	0	0	64	0	0	10	0	10	-	-	-	-	
<b>Heavy %</b>	0%	16.3%	18.2%	0%	16.3%	100%	0%	0%	0%	100%	40%	19.7%	0%	0%	21.1%	0%	0%	41.7%	0%	34.5%	-	-	-	-	
<b>Lights</b>	0	216	9	1	226	0	0	0	0	0	12	228	0	0	240	5	0	14	0	19	-	-	-	-	
<b>Lights %</b>	0%	83.7%	81.8%	100%	83.7%	0%	0%	0%	0%	0%	60%	80.3%	0%	0%	78.9%	100%	0%	58.3%	0%	65.5%	-	-	-	-	
<b>Single-Unit Trucks</b>	0	24	1	0	25	0	0	0	0	0	4	33	0	0	37	0	0	5	0	5	-	-	-	-	
<b>Single-Unit Trucks %</b>	0%	9.3%	9.1%	0%	9.3%	0%	0%	0%	0%	0%	20%	11.6%	0%	0%	12.2%	0%	0%	20.8%	0%	17.2%	-	-	-	-	
<b>Buses</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	
<b>Buses %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	-	-	
<b>Articulated Trucks</b>	0	18	1	0	19	1	0	0	0	1	4	23	0	0	27	0	0	5	0	5	-	-	-	-	
<b>Articulated Trucks %</b>	0%	7%	9.1%	0%	7%	100%	0%	0%	0%	100%	20%	8.1%	0%	0%	8.9%	0%	0%	20.8%	0%	17.2%	-	-	-	-	
<b>Pedestrians</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	
<b>Pedestrians%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	
<b>Bicycles on Road</b>	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	-	-	-	
<b>Bicycles on Road%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	



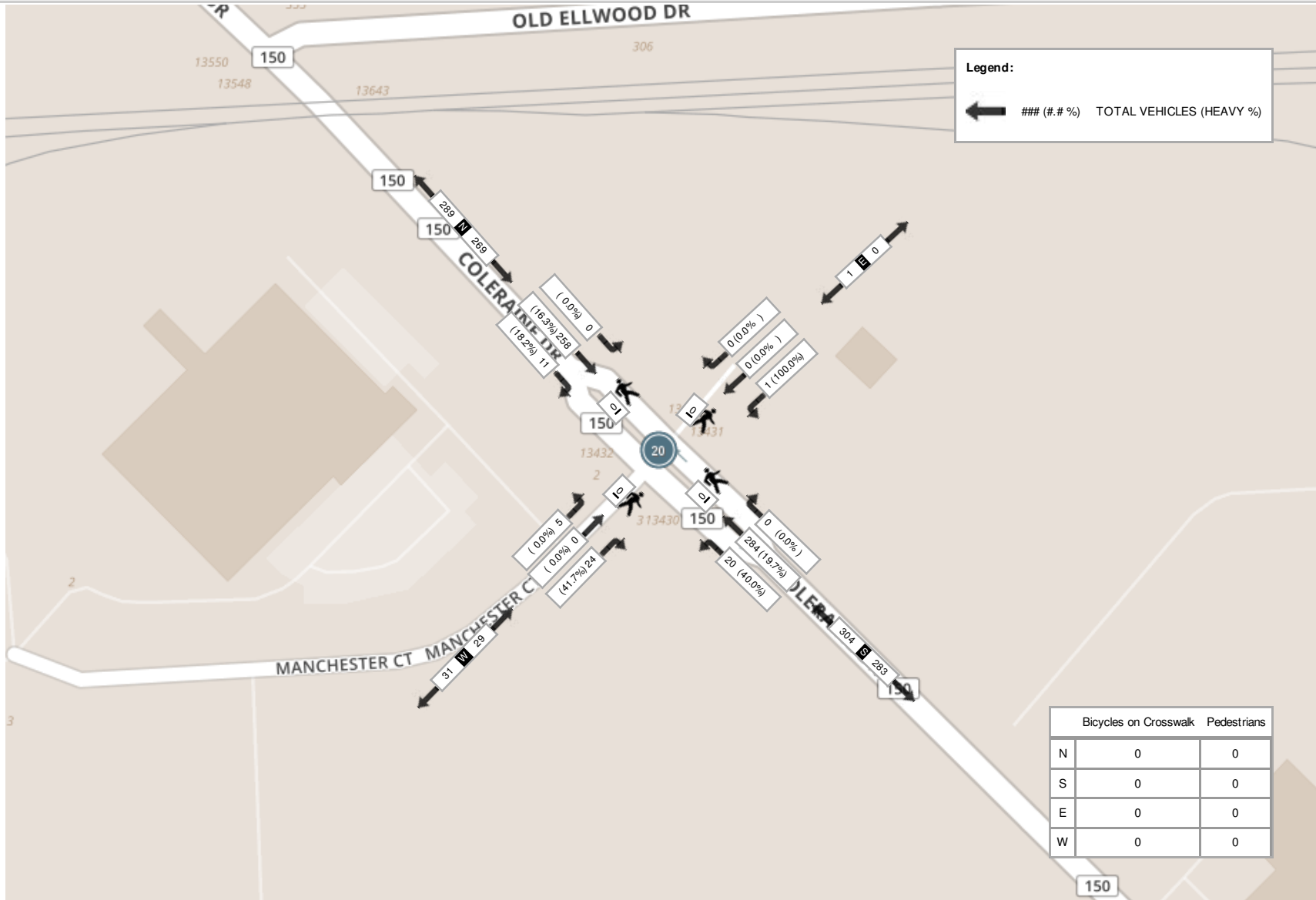
**Peak Hour: 04:30 PM - 05:30 PM Weather: Mostly Cloudy (15.8 °C)**

Start Time	Southbound COLERAINE DR						Westbound PRIVATE ACCESS						Northbound COLERAINE DR						Eastbound MANCHESTER COURT						Int. Total (15 min)
	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	Left	Thru	Right	U-Turn	Peds	Approach Total	
16:30:00	0	83	0	0	0	83	0	0	0	0	1	0	1	219	0	0	0	220	6	0	10	0	0	16	319
16:45:00	0	84	0	0	0	84	3	0	0	0	0	3	5	196	0	0	1	201	5	0	7	0	3	12	300
17:00:00	0	62	1	0	0	63	1	0	0	0	1	1	1	287	0	0	0	288	10	0	13	0	0	23	375
17:15:00	1	77	0	0	0	78	0	0	0	0	0	0	5	259	0	0	0	264	7	0	4	0	0	11	353
<b>Grand Total</b>	<b>1</b>	<b>306</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>308</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>12</b>	<b>961</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>973</b>	<b>28</b>	<b>0</b>	<b>34</b>	<b>0</b>	<b>3</b>	<b>62</b>	<b>1347</b>
<b>Approach%</b>	0.3%	99.4%	0.3%	0%	-	-	100%	0%	0%	0%	-	-	1.2%	98.8%	0%	0%	-	-	45.2%	0%	54.8%	0%	-	-	-
<b>Totals %</b>	0.1%	22.7%	0.1%	0%	22.9%	0.3%	0%	0%	0%	0.3%	0.9%	71.3%	0%	0%	72.2%	2.1%	0%	2.5%	0%	4.6%	-	-	-	-	-
<b>PHF</b>	0.25	0.91	0.25	0	0.92	0.33	0	0	0	0.33	0.6	0.84	0	0	0.84	0.7	0	0.65	0	0.67	-	-	-	-	-
<b>Heavy</b>	0	54	0	0	54	0	0	0	0	0	0	8	42	0	0	50	0	0	8	0	8	0	8	-	-
<b>Heavy %</b>	0%	17.6%	0%	0%	17.5%	0%	0%	0%	0%	0%	0%	66.7%	4.4%	0%	0%	5.1%	0%	0%	23.5%	0%	12.9%	-	-	-	-
<b>Lights</b>	1	252	1	0	254	4	0	0	0	4	4	919	0	0	923	28	0	26	0	54	-	-	-	-	-
<b>Lights %</b>	100%	82.4%	100%	0%	82.5%	100%	0%	0%	0%	100%	33.3%	95.6%	0%	0%	94.9%	100%	0%	76.5%	0%	87.1%	-	-	-	-	-
<b>Single-Unit Trucks</b>	0	40	0	0	40	0	0	0	0	0	4	29	0	0	33	0	0	2	0	2	-	-	-	-	-
<b>Single-Unit Trucks %</b>	0%	13.1%	0%	0%	13%	0%	0%	0%	0%	0%	33.3%	3%	0%	0%	3.4%	0%	0%	5.9%	0%	3.2%	-	-	-	-	-
<b>Buses</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
<b>Buses %</b>	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-	-	-	-	-
<b>Articulated Trucks</b>	0	14	0	0	14	0	0	0	0	0	4	13	0	0	17	0	0	6	0	6	-	-	-	-	-
<b>Articulated Trucks %</b>	0%	4.6%	0%	0%	4.5%	0%	0%	0%	0%	0%	33.3%	1.4%	0%	0%	1.7%	0%	0%	17.6%	0%	9.7%	-	-	-	-	-
<b>Pedestrians</b>	-	-	-	-	0	-	-	-	-	2	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-
<b>Pedestrians%</b>	-	-	-	-	0%	-	-	-	-	33.3%	-	-	-	-	16.7%	-	-	-	33.3%	-	-	-	-	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	1	-	-	-	-	-	-
<b>Bicycles on Crosswalk%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	16.7%	-	-	-	-	-	-
<b>Bicycles on Road</b>	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	-	-	-	-
<b>Bicycles on Road%</b>	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	0%	-	-	-	-	-	-

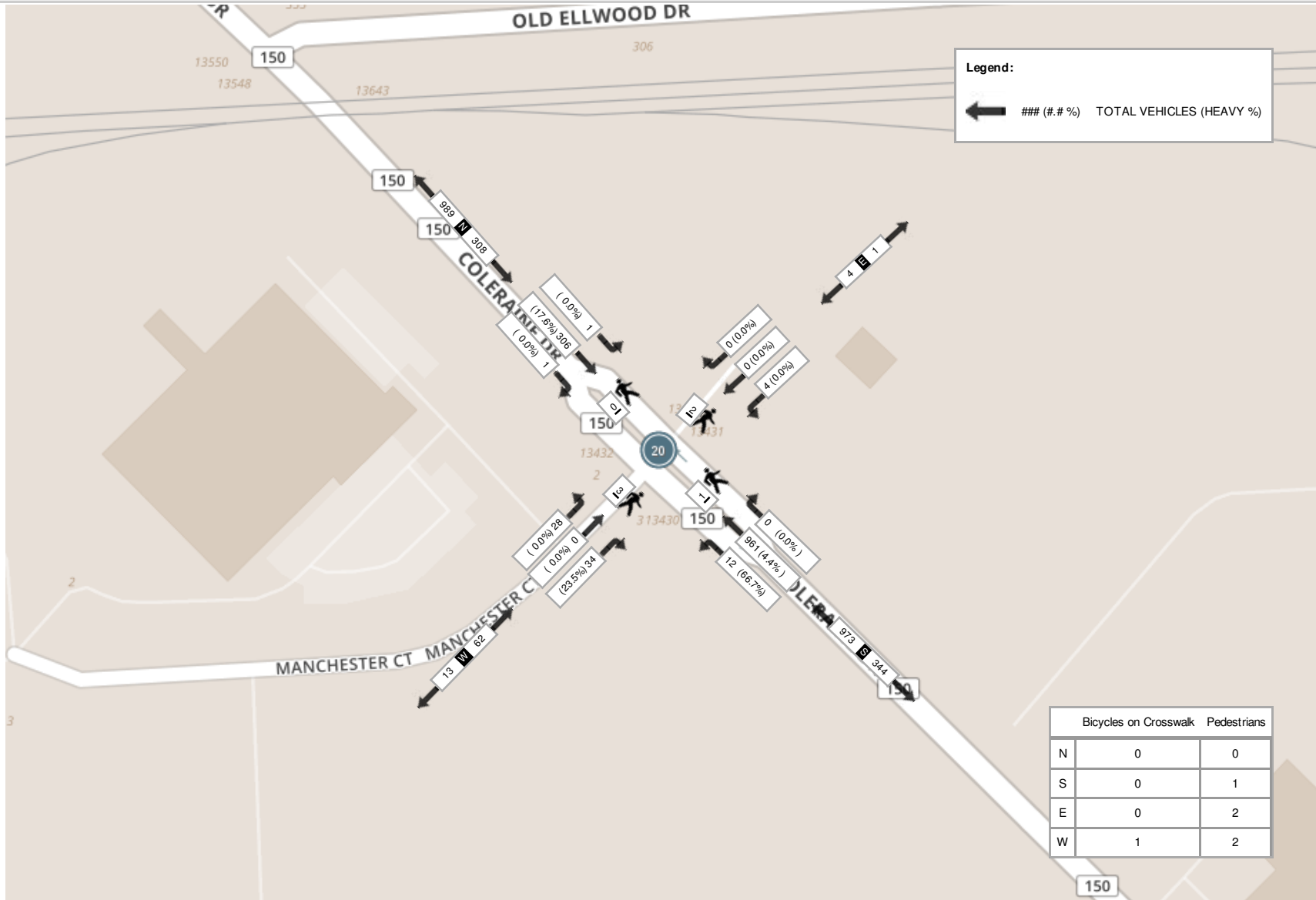
Peak Hour: 07:00 AM - 08:00 AM Weather: Clear (3.4 °C)



Peak Hour: 12:15 PM - 01:15 PM Weather: Mostly Cloudy (12.2 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Mostly Cloudy (15.8 °C)



## TMC - Intersection Count Summary

**Company name:** Trans-Plan Inc.  
**Company address:** 24 Ryerson Avenue, Suite 211, Toronto, Ontario, Canada  
**Company phone:** (647) 931-7383

**Site:** 15007180  
**Location:** Coleraine Drive at Holland Drive, Caledon  
**N/S Street:** Coleraine Drive  
**E/W Street:** Holland Drive  
**GPS Coordinates:** 43.864787, -79.742777  
**Date:** 13 May 2015  
**Day of week:** Wednesday  
**Analyst(s):** Muhammad Ali

### VEHICLE TRAFFIC

Interval	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
29/05/2015 07:00	26	161	0	187	9	0	20	29	0	38	4	42	0	0	0	0	258
29/05/2015 07:15	30	160	0	190	4	0	16	20	0	40	1	41	0	0	0	0	251
29/05/2015 07:30	37	137	0	174	3	0	11	14	0	27	4	31	0	0	0	0	219
29/05/2015 07:45	41	141	0	182	0	0	12	12	0	39	7	46	0	0	0	0	240
Hourly Total	134	599	0	733	16	0	59	75	0	144	16	160	0	0	0	0	968
29/05/2015 08:00	36	131	0	167	0	0	11	11	0	32	7	39	0	0	0	0	217
29/05/2015 08:15	47	108	0	155	5	0	7	12	0	31	10	41	0	0	0	0	208
29/05/2015 08:30	27	92	0	119	0	0	15	15	0	33	9	42	0	0	0	0	176
29/05/2015 08:45	41	76	0	117	2	0	10	12	0	42	10	52	0	0	0	0	181
Hourly Total	151	407	0	558	7	0	43	50	0	138	36	174	0	0	0	0	782
29/05/2015 09:00	0	3	0	3	0	0	1	1	0	2	1	3	0	0	0	0	7
29/05/2015 09:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	3	0	3	0	0	1	1	0	2	1	3	0	0	0	0	7
Grand Total	285	1009	0	1294	23	0	103	126	0	284	53	337	0	0	0	0	1757
Approach %	22	78	0	100	18	0	82	100	0	84	16	100	0	0	0	0	-
Total %	16	57	0	73	1	0	6	7	0	16	3	19	0	0	0	0	-

#### AM Peak Hour 7:00 AM - 8:00 AM

Vehicle Total	134	599	0	733	16	0	59	75	0	144	16	160	0	0	0	0	968
Car	119	542	0	661	13	0	49	62	0	102	16	118	0	0	0	0	841
Truck	15	57	0	72	3	0	10	13	0	41	0	41	0	0	0	0	126
Bicycle	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1

Interval	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
13/05/2015 11:00	14	44	0	58	1	0	14	15	0	33	0	33	0	0	0	0	106
13/05/2015 11:15	20	51	0	71	0	0	19	19	0	39	2	41	0	0	0	0	131
13/05/2015 11:30	13	31	0	44	1	0	14	15	0	39	0	39	0	0	0	0	98
13/05/2015 11:45	11	51	0	62	6	0	16	22	0	59	1	60	0	0	0	0	144
Hourly Total	58	177	0	235	8	0	63	71	0	170	3	173	0	0	0	0	479
13/05/2015 12:00	13	65	0	78	2	0	30	32	0	53	2	55	0	0	0	0	165
13/05/2015 12:15	17	56	0	73	1	0	22	23	0	54	4	58	0	0	0	0	154
13/05/2015 12:30	8	30	0	38	2	0	35	37	0	41	1	42	0	0	0	0	117
13/05/2015 12:45	19	60	0	79	2	0	20	22	0	40	2	42	0	0	0	0	143
Hourly Total	57	211	0	268	7	0	107	114	0	188	9	197	0	0	0	0	579
13/05/2015 13:00	17	51	0	68	2	0	15	17	0	35	1	36	0	0	0	0	121
13/05/2015 13:15	17	34	0	51	3	0	22	25	0	45	0	45	0	0	0	0	121
13/05/2015 13:30	10	36	0	46	4	0	21	25	0	33	0	33	0	0	0	0	104
13/05/2015 13:45	27	38	0	65	4	0	22	26	0	54	3	57	0	0	0	0	148
Hourly Total	71	159	0	230	13	0	80	93	0	167	4	171	0	0	0	0	494
13/05/2015 14:00	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
13/05/2015 14:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Grand Total	186	549	0	735	28	0	250	278	0	525	16	541	0	0	0	0	1554
Approach %	25	75	0	100	10	0	90	100	0	97	3	100	0	0	0	0	-
Total %	12	35	0	47	2	0	16	18	0	34	1	35	0	0	0	0	-

**Midday Peak Hour 11:45 AM - 12:45 PM**

Vehicle Total	49	202	0	251	11	0	103	114	0	207	8	215	0	0	0	0	580
Car	44	167	0	211	5	0	90	95	0	156	6	162	0	0	0	0	468
Truck	5	35	0	40	6	0	13	19	0	51	2	53	0	0	0	0	112
Bicycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Interval	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
13/05/2015 15:00	15	74	0	89	5	0	44	49	0	65	0	65	0	0	0	0	203
13/05/2015 15:15	23	46	0	69	4	0	29	33	0	72	1	73	0	0	0	0	175
13/05/2015 15:30	21	58	0	79	3	0	52	55	0	93	2	95	0	0	0	0	229
13/05/2015 15:45	29	48	0	77	2	0	35	37	0	81	4	85	0	0	0	0	199
Hourly Total	88	226	0	314	14	0	160	174	0	311	7	318	0	0	0	0	806
13/05/2015 16:00	28	74	0	102	9	0	68	77	0	119	2	121	0	0	0	0	300
13/05/2015 16:15	29	57	0	86	1	0	48	49	0	102	5	107	0	0	0	0	242
13/05/2015 16:30	18	48	0	66	14	0	58	72	0	101	0	101	0	0	0	0	239
13/05/2015 16:45	29	43	0	72	5	0	76	81	0	118	3	121	0	0	0	0	274
Hourly Total	104	222	0	326	29	0	250	279	0	440	10	450	0	0	0	0	1055
13/05/2015 17:00	16	54	0	70	6	0	82	88	0	118	3	121	0	0	0	0	279
13/05/2015 17:15	19	47	0	66	6	0	72	78	0	139	1	140	0	0	0	0	284
13/05/2015 17:30	19	61	0	80	10	0	66	76	0	145	4	149	0	0	0	0	305
13/05/2015 17:45	25	56	0	81	5	0	63	68	0	112	2	114	0	0	0	0	263
Hourly Total	79	218	0	297	27	0	283	310	0	514	10	524	0	0	0	0	1131
13/05/2015 18:00	1	0	0	1	0	0	1	1	0	11	0	11	0	0	0	0	13
13/05/2015 18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	1	0	0	1	0	0	1	1	0	11	0	11	0	0	0	0	13
Grand Total	272	666	0	938	70	0	694	764	0	1276	27	1303	0	0	0	0	3005
Approach %	29	71	0	100	9	0	91	100	0	98	2	100	0	0	0	0	-
Total %	9	22	0	31	2	0	23	25	0	42	1	43	0	0	0	0	-

PM Peak Hour 4:45 PM - 5:45 PM

Vehicle Total	83	205	0	288	27	0	296	323	0	520	11	531	0	0	0	0	1142
Car	69	175	0	244	25	0	285	310	0	473	5	478	0	0	0	0	1032
Truck	14	30	0	44	2	0	11	13	0	46	6	52	0	0	0	0	109
Bicycle	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1

# PEDESTRIAN CROSSING

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
29/05/2015 07:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
29/05/2015 07:15:00	0	0	0	1	0	1	0	0	0	0	0	0	1
29/05/2015 07:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
29/05/2015 07:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	1	0	1	0	0	0	0	0	0	1
29/05/2015 08:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
29/05/2015 08:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
29/05/2015 08:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
29/05/2015 08:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
29/05/2015 09:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
29/05/2015 09:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	1	0	1	0	0	0	0	0	0	1

## AM Peak Hour 7:00 AM - 8:00 AM

Pedestrians	0	0	0	1	0	1	0	0	0	0	0	0	1
-------------	---	---	---	---	---	---	---	---	---	---	---	---	---

13/05/2015 11:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 11:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 11:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 11:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 12:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 12:15:00	0	0	0	0	0	0	0	0	0	0	2	2	2
13/05/2015 12:30:00	0	0	0	0	1	1	1	0	1	0	0	0	2
13/05/2015 12:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	1	1	1	0	1	0	2	2	4
13/05/2015 13:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 13:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 13:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 13:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 14:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13/05/2015 14:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	1	1	1	0	1	0	2	2	4

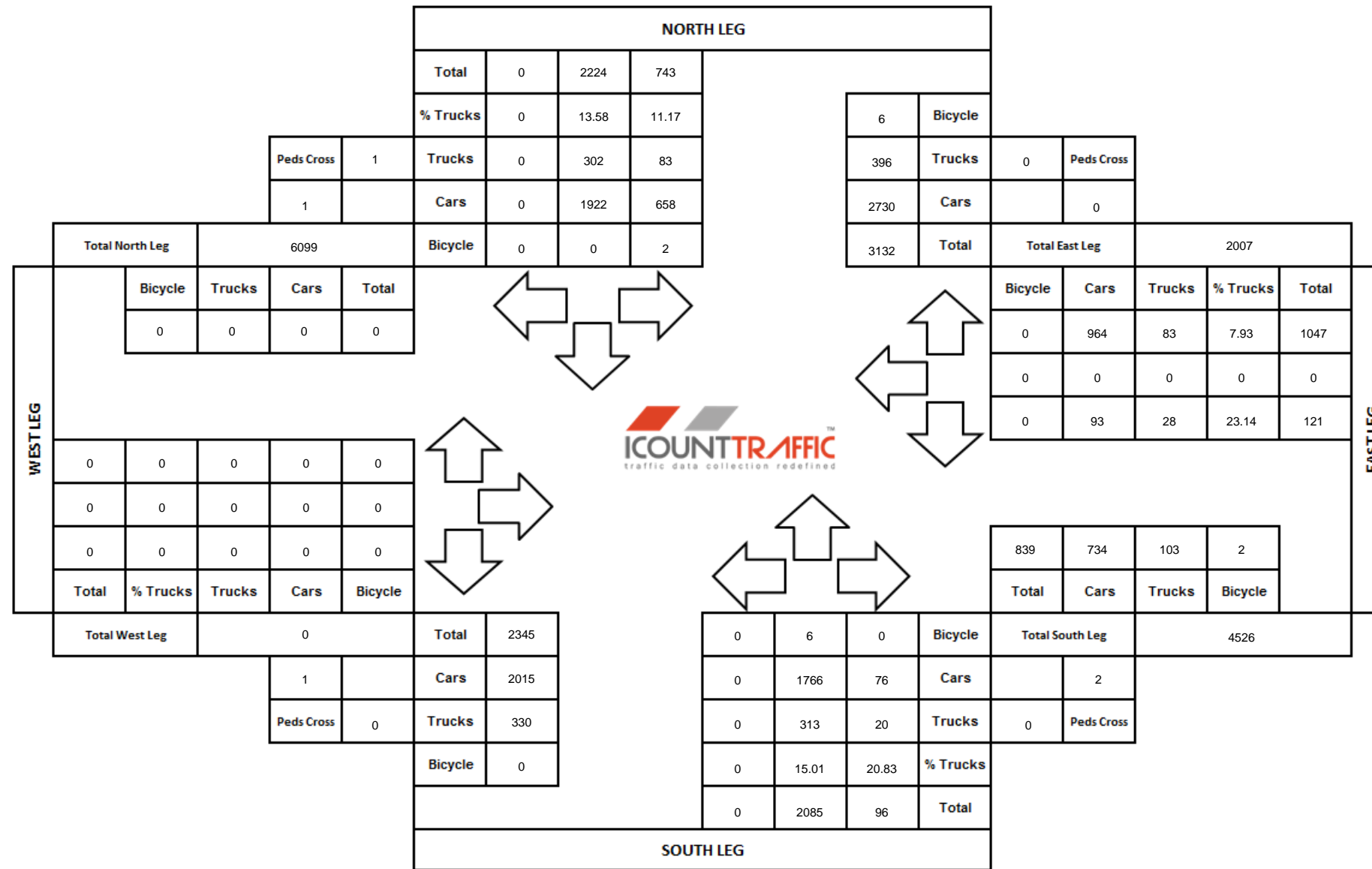
## Midday Peak Hour 11:45 AM - 12:45 PM

Pedestrians	0	0	0	0	1	1	1	0	1	0	2	2	4
-------------	---	---	---	---	---	---	---	---	---	---	---	---	---

No pedestrian crossing for PM.

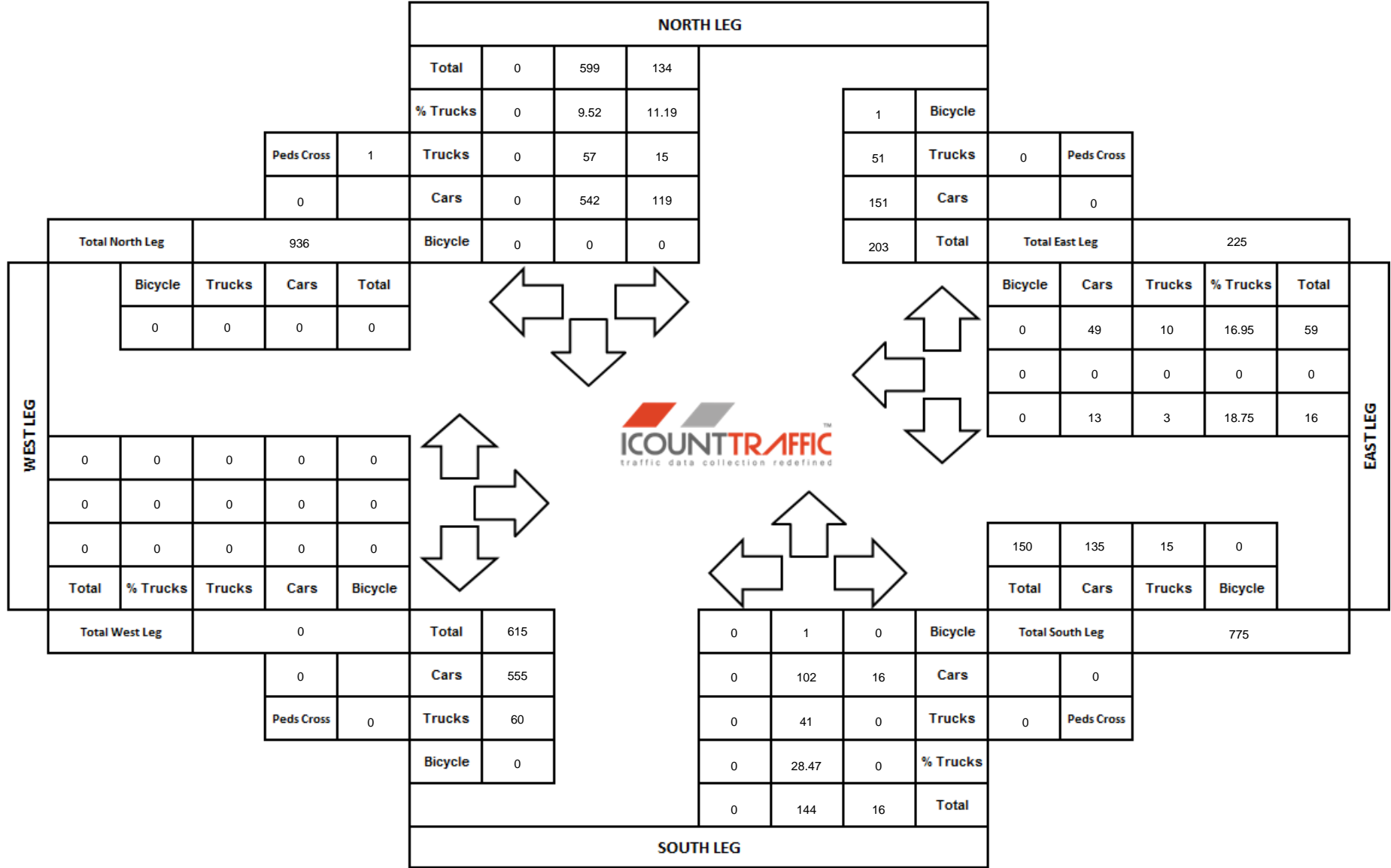
# TOTAL TMC COUNT DIAGRAM

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive	Count Date:	13/05/2015
East/West Street:	Holland Drive	Count Period:	AM, Noon, PM
GPS Coordinates:	43.864787, -79.742777	Peak Period:	7:00 AM - 8:00 AM, 11:45 AM - 12:45 PM, 4:45 PM - 5:45 PM
Site Number:	15007180	Major Road:	Coleraine Drive
Control:	Non signalized	Surveyor:	Muhammad Ali



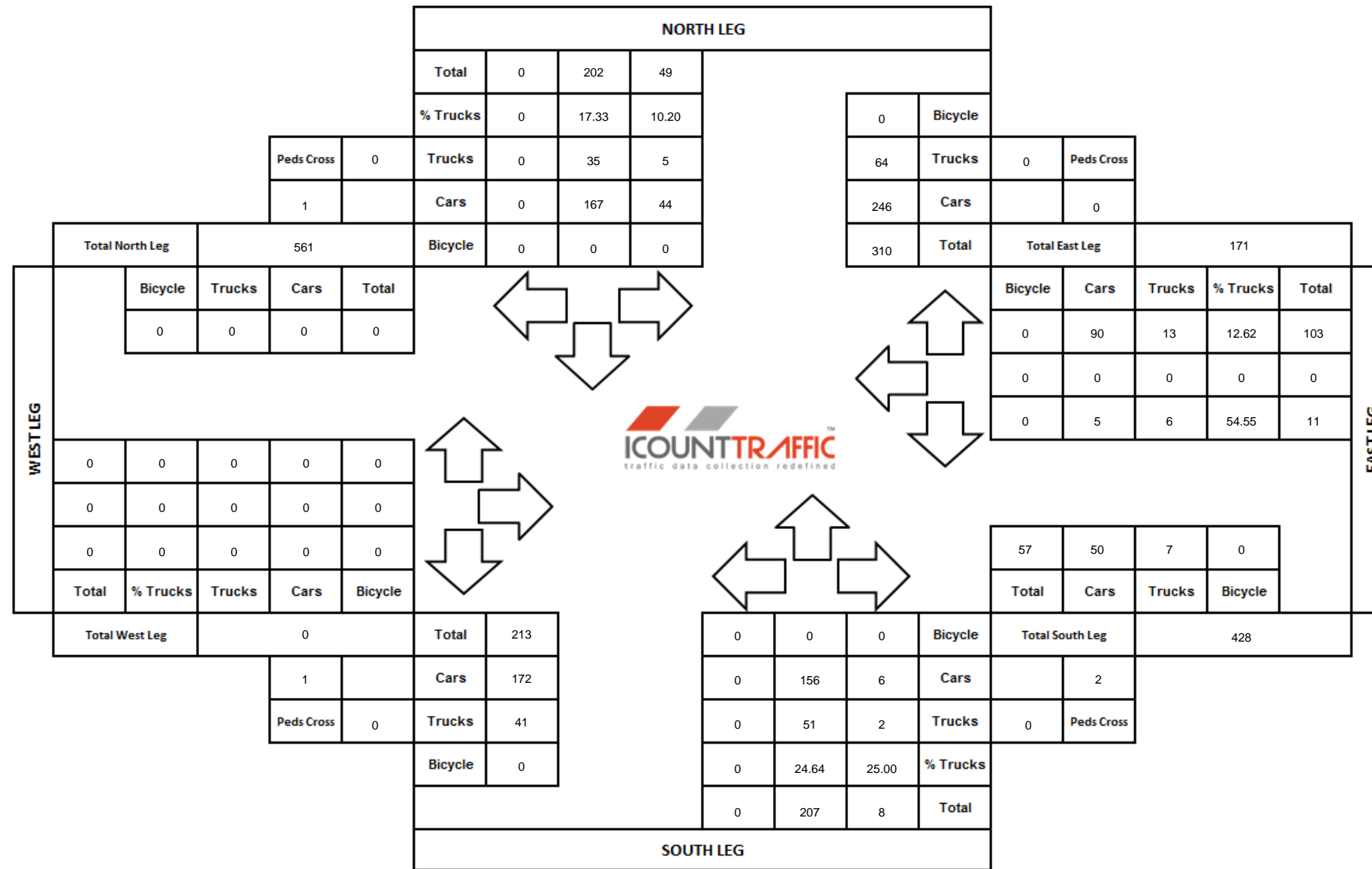
# AM Peak Hour Count Diagram

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive	Count Date:	13/05/2015
East/West Street:	Holland Drive	Count Period:	AM
GPS Coordinates:	43.864787, -79.742777	Peak Period:	7:00 AM - 8:00 AM
Site Number:	15007180	Major Road:	Coleraine Drive
Control:	Non signalized	Surveyor:	Muhammad Ali



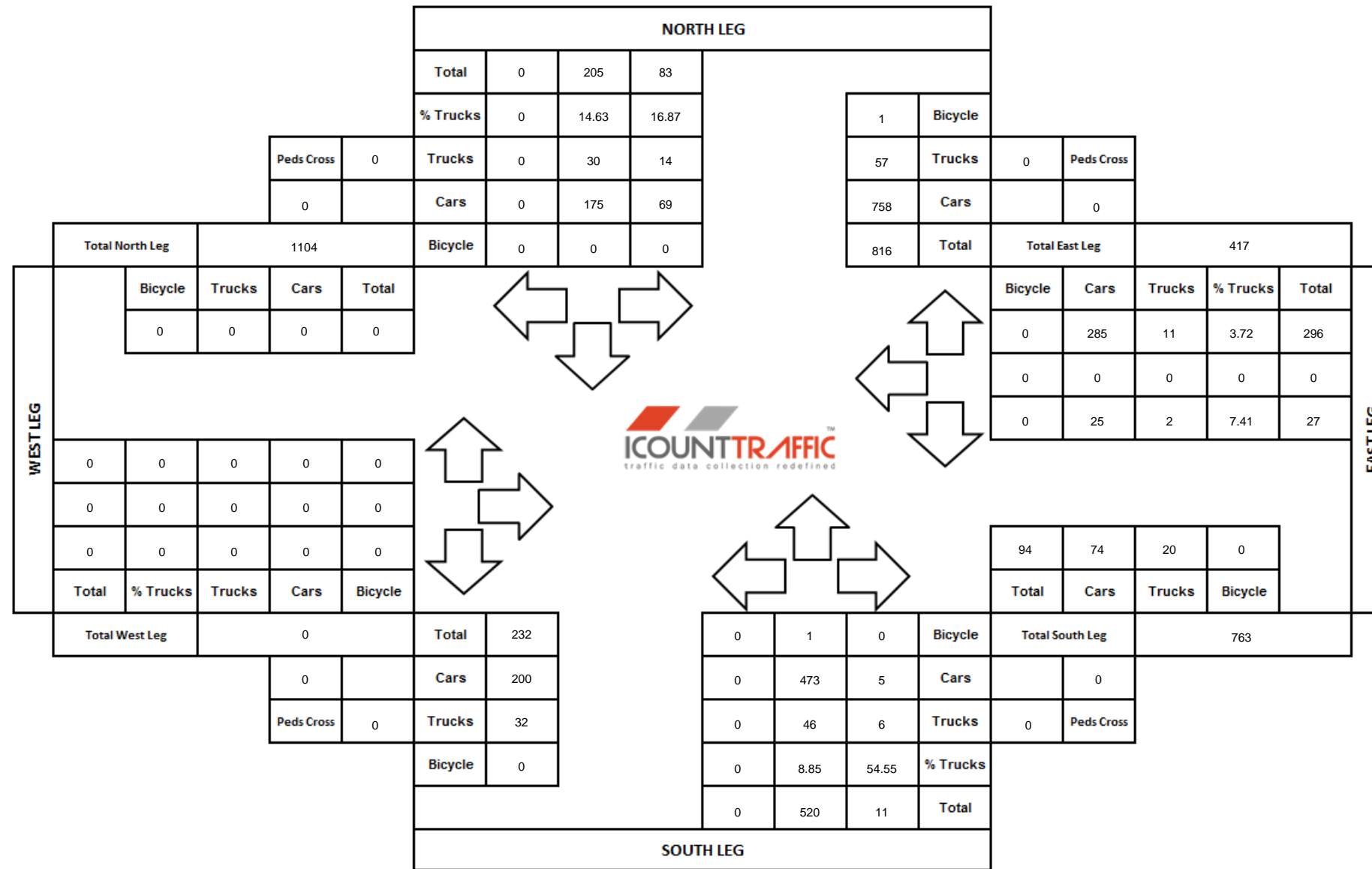
# Noon Peak Hour Count Diagram

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive	Count Date:	13/05/2015
East/West Street:	Holland Drive	Count Period:	Noon
GPS Coordinates:	43.864787, -79.742777	Peak Period:	11:45 AM - 12:45 PM
Site Number:	15007180	Major Road:	Coleraine Drive
Control:	Non signalized	Surveyor:	Muhammad Ali

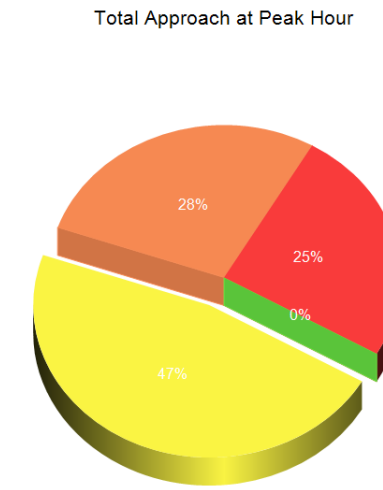
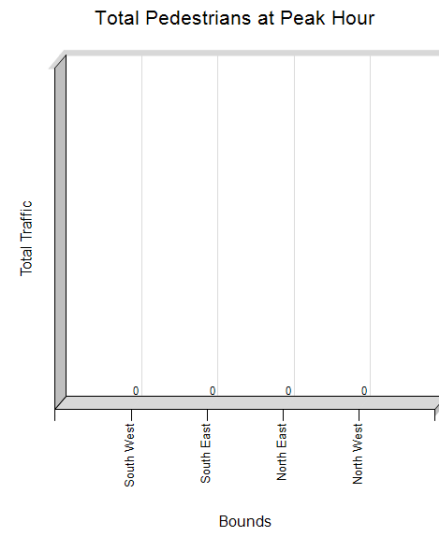
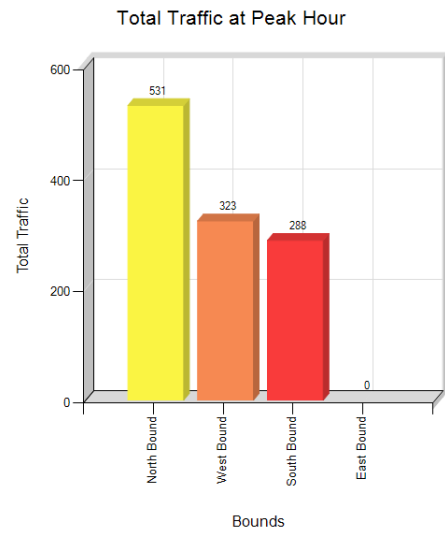
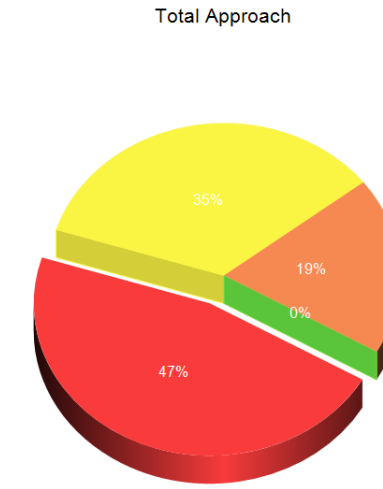
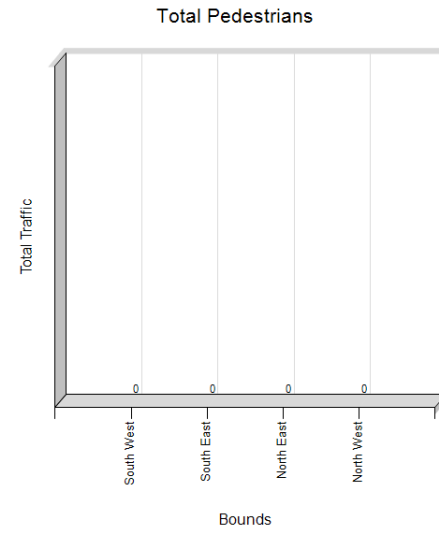
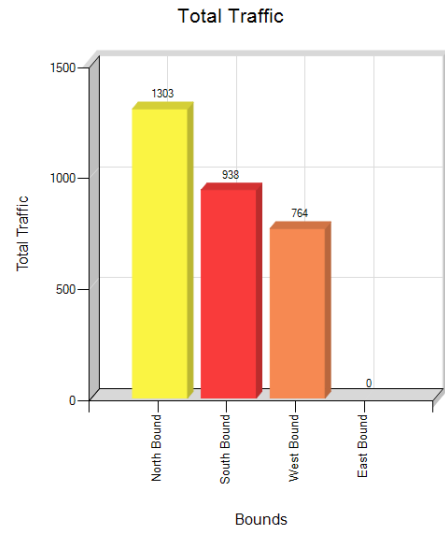


# PM Peak Hour Count Diagram

City:	Caledon	Weather:	Partly Cloudy
North/South Street:	Coleraine Drive	Count Date:	13/05/2015
East/West Street:	Holland Drive	Count Period:	PM
GPS Coordinates:	43.864787, -79.742777	Peak Period:	4:45 PM - 5:45 PM
Site Number:	15007180	Major Road:	Coleraine Drive
Control:	Non signalized	Surveyor:	Muhammad Ali



# TMC chart data



SouthBound	NorthEast
WestBound	NorthWest
NorthBound	SouthWest
EastBound	SouthEast

NOTES & IMAGES



Coleraine Drive South Leg



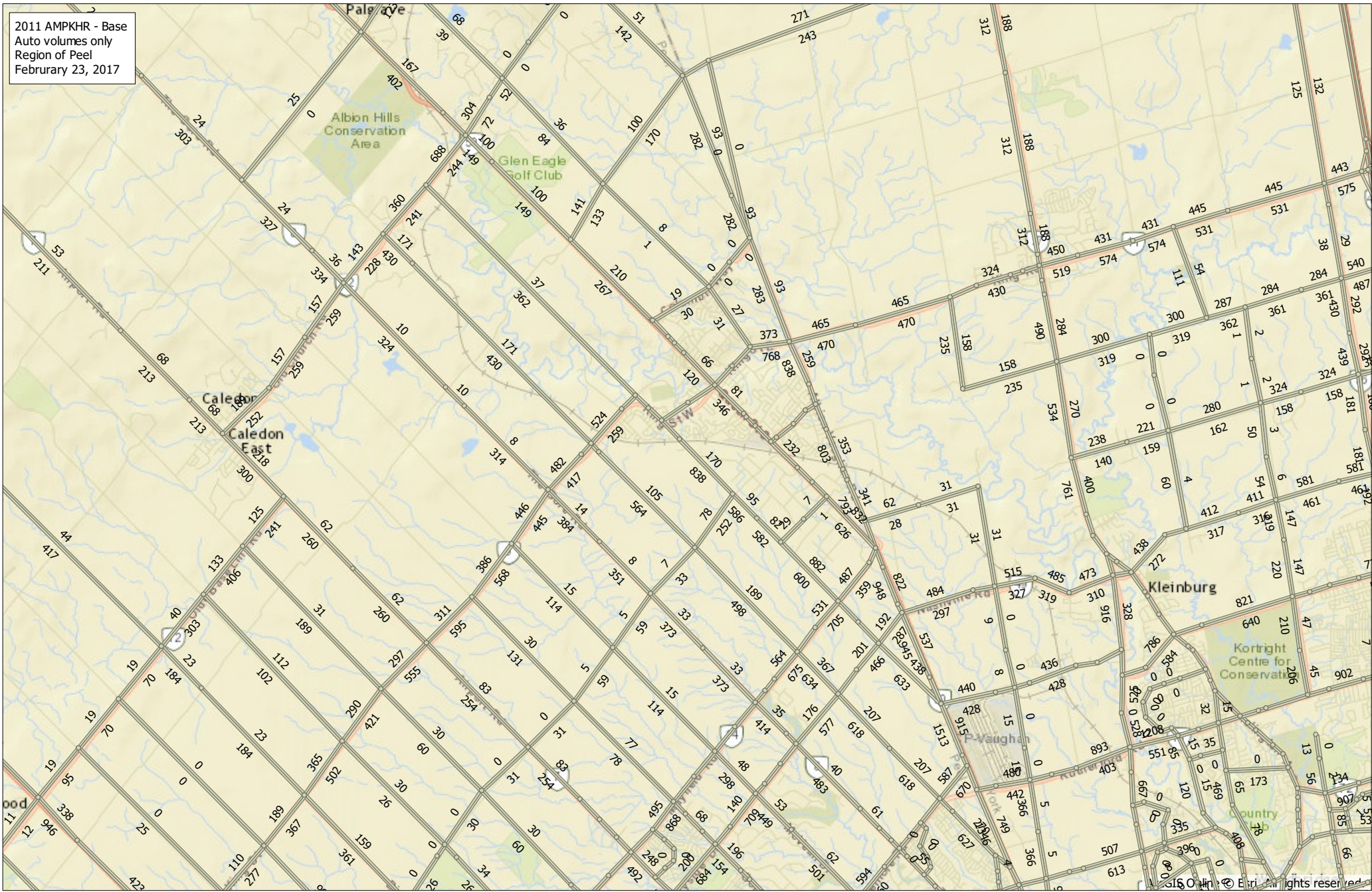
Coleraine Drive North Leg



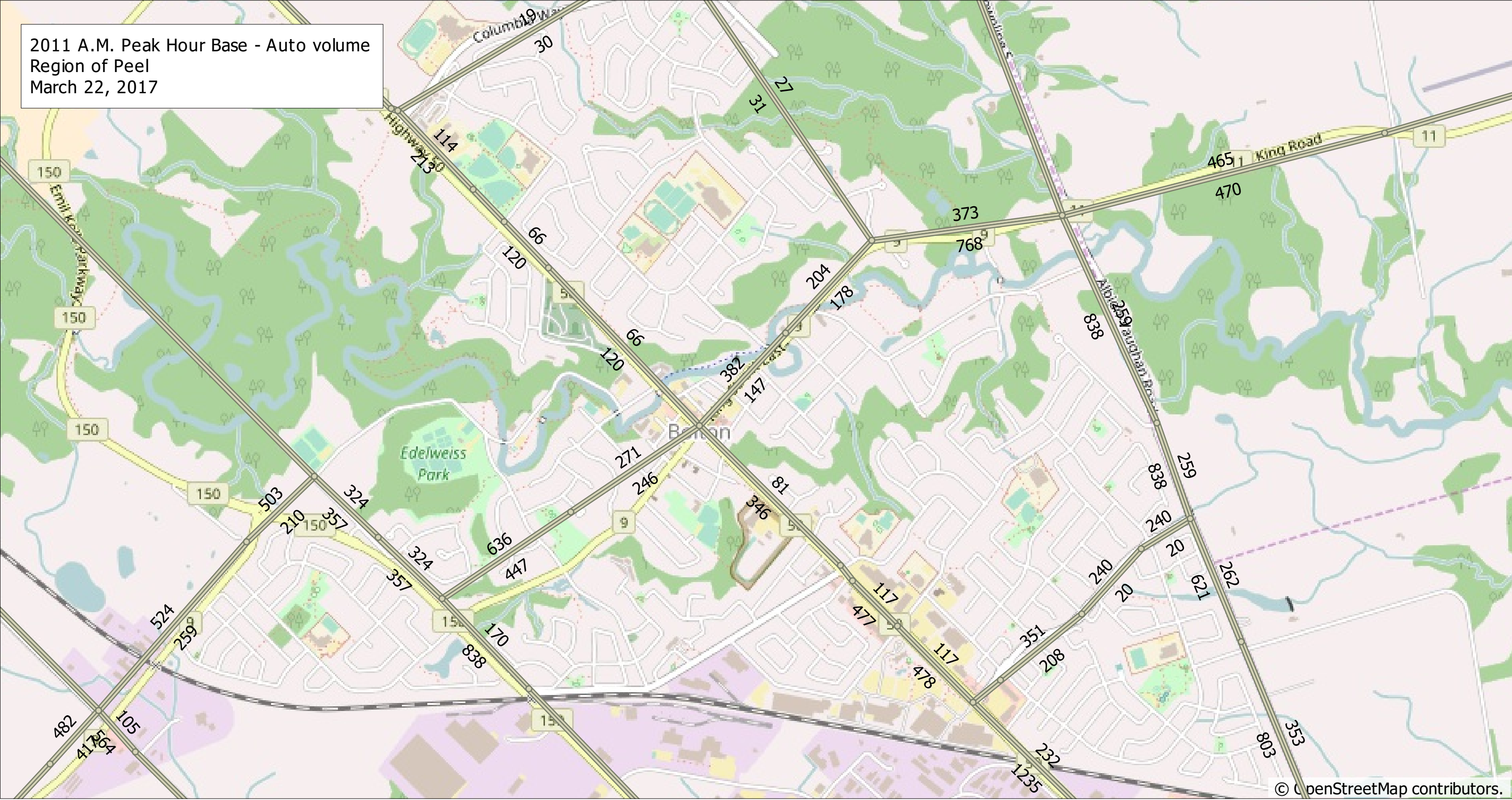
Halland Drive East Leg



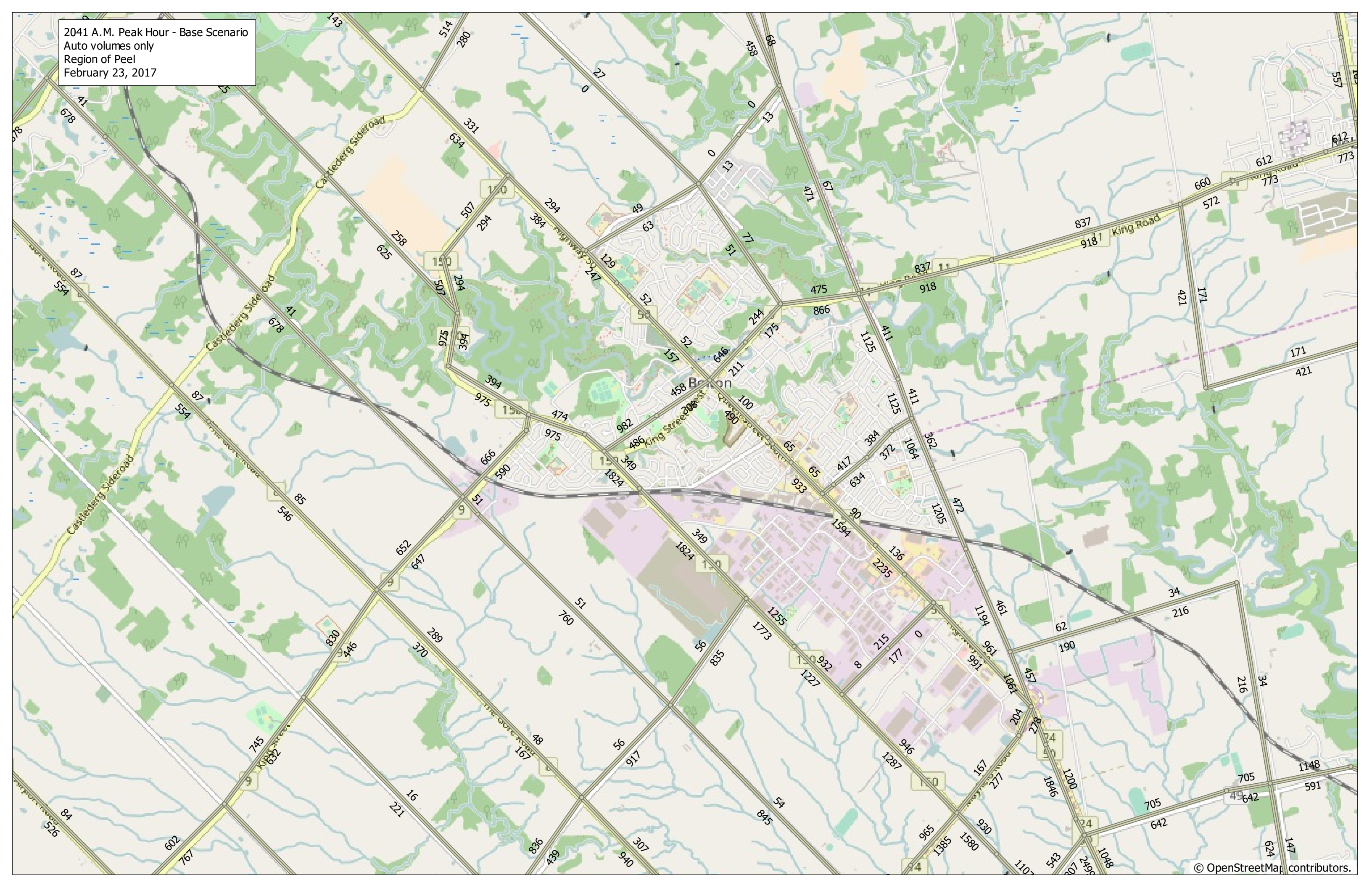
2011 AMPKHR - Base  
Auto volumes only  
Region of Peel  
February 23, 2017



2011 A.M. Peak Hour Base - Auto volume  
Region of Peel  
March 22, 2017



2041 A.M. Peak Hour - Base Scenario  
Auto volumes only  
Region of Peel  
February 23, 2017



# APPENDIX B
























## Synchro/SimTraffic Outputs

B000738



HCM Signalized Intersection Capacity Analysis  
 1: Coleraine Drive & Harvest Moon Drive/King Street West

2017 Existing Conditions  
 Timing Plan: Weekday AM Peak

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	4	96	364	201	35	186	43	107	61	137	368	5	
Future Volume (vph)	4	96	364	201	35	186	43	107	61	137	368	5	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7	
Total Lost time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6		
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95		
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)		1659	1568	1675	1812	1601	1691	2874	1526	1725	3225		
Flt Permitted		0.99	1.00	0.63	1.00	1.00	0.52	1.00	1.00	0.63	1.00		
Satd. Flow (perm)		1641	1568	1106	1812	1601	928	2874	1526	1144	3225		
Peak-hour factor, PHF	0.50	0.83	0.95	0.88	0.58	0.83	0.83	0.79	0.85	0.84	0.98	0.63	
Adj. Flow (vph)	8	116	383	228	60	224	52	135	72	163	376	8	
RTOR Reduction (vph)	0	0	250	0	0	121	0	0	48	0	1	0	
Lane Group Flow (vph)	0	124	133	228	60	103	52	135	24	163	383	0	
Heavy Vehicles (%)	25%	8%	3%	3%	6%	2%	2%	27%	7%	0%	13%	4%	
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		
Protected Phases		8		7	4		1	6		5	2		
Permitted Phases	8		8	4		4	6		6	2			
Actuated Green, G (s)		37.9	37.9	49.9	49.9	49.9	40.2	36.3	36.3	44.4	38.4		
Effective Green, g (s)		37.9	37.9	49.9	49.9	49.9	40.2	36.3	36.3	44.4	38.4		
Actuated g/C Ratio		0.35	0.35	0.46	0.46	0.46	0.37	0.33	0.33	0.41	0.35		
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6		
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)		571	545	553	830	733	369	958	508	498	1137		
v/s Ratio Prot				c0.03	0.03		0.01	0.05		c0.02	c0.12		
v/s Ratio Perm		0.08	0.09	c0.15		0.06	0.05		0.02	0.12			
v/c Ratio		0.22	0.24	0.41	0.07	0.14	0.14	0.14	0.05	0.33	0.34		
Uniform Delay, d1		25.0	25.3	18.6	16.5	17.1	22.4	25.4	24.6	21.3	25.9		
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2		0.9	1.1	0.5	0.2	0.4	0.2	0.1	0.0	0.4	0.8		
Delay (s)		25.9	26.4	19.1	16.7	17.5	22.5	25.5	24.6	21.7	26.7		
Level of Service		C	C	B	B	B	C	C	C	C	C		
Approach Delay (s)		26.3			18.1			24.6			25.2		
Approach LOS		C			B			C			C		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			23.4		HCM 2000 Level of Service					C			
HCM 2000 Volume to Capacity ratio			0.40										
Actuated Cycle Length (s)			108.9		Sum of lost time (s)					19.7			
Intersection Capacity Utilization			61.3%		ICU Level of Service					B			
Analysis Period (min)			15										

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 2: Station Road & King Street West

2017 Existing Conditions  
Timing Plan: Weekday AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	287	5	9	377	3	3	4	25	18	9	42
Future Volume (vph)	2	287	5	9	377	3	3	4	25	18	9	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.89		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1801	1820		1805	1840		1805	1693		1805	1628	
Flt Permitted	0.49	1.00		0.54	1.00		0.52	1.00		0.73	1.00	
Satd. Flow (perm)	925	1820		1027	1840		993	1693		1384	1628	
Peak-hour factor, PHF	0.50	0.80	0.42	0.50	0.82	0.38	0.38	0.33	0.78	0.64	0.38	0.25
Adj. Flow (vph)	4	359	12	18	460	8	8	12	32	28	24	168
RTOR Reduction (vph)	0	1	0	0	0	0	0	28	0	0	147	0
Lane Group Flow (vph)	4	370	0	18	468	0	8	16	0	28	45	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%	0%	0%	0%	0%	11%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	50.8	50.8		50.8	50.8		9.1	9.1		9.1	9.1	
Effective Green, g (s)	50.8	50.8		50.8	50.8		9.1	9.1		9.1	9.1	
Actuated g/C Ratio	0.70	0.70		0.70	0.70		0.12	0.12		0.12	0.12	
Clearance Time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	643	1266		714	1280		123	211		172	202	
v/s Ratio Prot		0.20			c0.25			0.01			c0.03	
v/s Ratio Perm	0.00			0.02			0.01			0.02		
v/c Ratio	0.01	0.29		0.03	0.37		0.07	0.08		0.16	0.22	
Uniform Delay, d1	3.4	4.2		3.4	4.5		28.2	28.2		28.5	28.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.6		0.1	0.8		0.2	0.2		0.4	0.6	
Delay (s)	3.4	4.8		3.5	5.3		28.4	28.4		29.0	29.3	
Level of Service	A	A		A	A		C	C		C	C	
Approach Delay (s)		4.8			5.3			28.4			29.3	
Approach LOS		A			A			C			C	

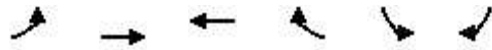
### Intersection Summary

HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	73.0	Sum of lost time (s)	13.1
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 3: Old Ellwood Drive & Station Road

2017 Existing Conditions  
 Timing Plan: Weekday AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	1	147	71	11	69	17
Future Volume (vph)	1	147	71	11	69	17
Peak Hour Factor	0.25	0.84	0.77	0.39	0.72	0.71
Hourly flow rate (vph)	4	175	92	28	96	24

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	179	120	120
Volume Left (vph)	4	0	96
Volume Right (vph)	0	28	24
Hadj (s)	0.04	-0.13	0.09
Departure Headway (s)	4.4	4.3	4.7
Degree Utilization, x	0.22	0.14	0.16
Capacity (veh/h)	799	803	726
Control Delay (s)	8.6	8.0	8.5
Approach Delay (s)	8.6	8.0	8.5
Approach LOS	A	A	A

Intersection Summary			
Delay		8.4	
Level of Service		A	
Intersection Capacity Utilization	20.1%		ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
4: Coleraine Drive & Old Ellwood Drive

2017 Existing Conditions  
Timing Plan: Weekday AM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	WT		WT		WT	WT
Traffic Volume (vph)	47	42	148	27	121	870
Future Volume (vph)	47	42	148	27	121	870
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		7.7		5.3	5.3
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.94		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1651		2773		1787	3471
Flt Permitted	0.97		1.00		0.62	1.00
Satd. Flow (perm)	1651		2773		1160	3471
Peak-hour factor, PHF	0.73	0.88	0.84	0.68	0.82	0.83
Adj. Flow (vph)	64	48	176	40	148	1048
RTOR Reduction (vph)	42	0	13	0	0	0
Lane Group Flow (vph)	70	0	203	0	148	1048
Heavy Vehicles (%)	2%	10%	31%	7%	1%	4%
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	8.1		44.5		46.9	46.9
Effective Green, g (s)	8.1		44.5		46.9	46.9
Actuated g/C Ratio	0.12		0.67		0.70	0.70
Clearance Time (s)	6.5		7.7		5.3	5.3
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	200		1847		814	2436
v/s Ratio Prot	c0.04		0.07			c0.30
v/s Ratio Perm					0.13	
v/c Ratio	0.35		0.11		0.18	0.43
Uniform Delay, d1	26.9		4.0		3.4	4.2
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.1		0.1		0.5	0.6
Delay (s)	28.0		4.1		3.9	4.8
Level of Service	C		A		A	A
Approach Delay (s)	28.0		4.1			4.7
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	66.8	Sum of lost time (s)	14.2
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



HCM Unsignalized Intersection Capacity Analysis  
5: Coleraine Drive & Ellwood Drive West













2017 Existing Conditions  
Timing Plan: Weekday AM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	64	25	186	4	6	927
Future Volume (Veh/h)	64	25	186	4	6	927
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.64	0.89	0.85	0.33	0.38	0.87
Hourly flow rate (vph)	100	28	219	12	16	1066
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage veh				2		
Upstream signal (m)	120			300		
pX, platoon unblocked	0.95					
vC, conflicting volume	790	116			231	
vC1, stage 1 conf vol	225					
vC2, stage 2 conf vol	565					
vCu, unblocked vol	664	116			231	
tC, single (s)	6.8	7.0			4.8	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.5	
p0 queue free %	81	97			99	
cM capacity (veh/h)	539	909			1136	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	128	146	85	16	533	533
Volume Left	100	0	0	16	0	0
Volume Right	28	0	12	0	0	0
cSH	592	1700	1700	1136	1700	1700
Volume to Capacity	0.22	0.09	0.05	0.01	0.31	0.31
Queue Length 95th (m)	6.5	0.0	0.0	0.3	0.0	0.0
Control Delay (s)	12.8	0.0	0.0	8.2	0.0	0.0
Lane LOS	B			A		
Approach Delay (s)	12.8	0.0			0.1	
Approach LOS	B					
Intersection Summary						
Average Delay			1.2			
Intersection Capacity Utilization			37.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis  
6: Coleraine Drive

2017 Existing Conditions  
Timing Plan: Weekday AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑			↑			↑↑			↑↑	
Traffic Volume (vph)	0	0	0	0	0	0	0	917	0	0	175	0
Future Volume (vph)	0	0	0	0	0	0	0	917	0	0	175	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)								4.5			4.5	
Lane Util. Factor								0.95			0.95	
Frt								1.00			1.00	
Flt Protected								1.00			1.00	
Satd. Flow (prot)								3539			3539	
Flt Permitted								1.00			1.00	
Satd. Flow (perm)								3539			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0	0	997	0	0	190	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	997	0	0	190	0
Turn Type								NA			NA	
Protected Phases		4			8			6			2	
Permitted Phases												
Actuated Green, G (s)								56.5			56.5	
Effective Green, g (s)								56.5			56.5	
Actuated g/C Ratio								0.72			0.72	
Clearance Time (s)								4.5			4.5	
Vehicle Extension (s)								3.0			3.0	
Lane Grp Cap (vph)								2534			2534	
v/s Ratio Prot								c0.28			0.05	
v/s Ratio Perm												
v/c Ratio								0.39			0.07	
Uniform Delay, d1								4.4			3.4	
Progression Factor								1.00			1.00	
Incremental Delay, d2								0.5			0.1	
Delay (s)								4.9			3.4	
Level of Service								A			A	
Approach Delay (s)		0.0			0.0			4.9			3.4	
Approach LOS		A			A			A			A	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			4.7					HCM 2000 Level of Service			A	
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			78.9					Sum of lost time (s)			9.0	
Intersection Capacity Utilization			29.1%					ICU Level of Service			A	
Analysis Period (min)			15									
c Critical Lane Group												

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	1933	2051	1927	2006	1968	1978
Vehs Exited	1913	2050	1922	1987	1967	1966
Starting Vehs	71	56	79	54	71	64
Ending Vehs	91	57	84	73	72	75
Travel Distance (km)	2936	3125	2920	3078	3035	3019
Travel Time (hr)	70.1	85.9	79.5	76.9	79.2	78.3
Total Delay (hr)	14.0	26.8	23.9	18.5	21.2	20.9
Total Stops	1790	2334	2091	1947	2015	2038
Fuel Used (l)	229.3	257.6	238.6	243.1	244.6	242.7

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	1933	2051	1927	2006	1968	1978
Vehs Exited	1913	2050	1922	1987	1967	1966
Starting Vehs	71	56	79	54	71	64
Ending Vehs	91	57	84	73	72	75
Travel Distance (km)	2936	3125	2920	3078	3035	3019
Travel Time (hr)	70.1	85.9	79.5	76.9	79.2	78.3
Total Delay (hr)	14.0	26.8	23.9	18.5	21.2	20.9
Total Stops	1790	2334	2091	1947	2015	2038
Fuel Used (l)	229.3	257.6	238.6	243.1	244.6	242.7

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	L	T	T	R	L	T	TR
Maximum Queue (m)	36.3	56.4	47.6	17.6	28.4	34.8	31.7	21.2	45.4	55.2	51.9
Average Queue (m)	14.7	26.2	22.7	2.6	9.9	14.6	10.8	8.0	19.9	26.3	28.2
95th Queue (m)	30.0	45.6	44.4	9.9	23.4	30.8	25.9	17.3	37.1	43.6	45.3
Link Distance (m)	235.7			487.5		280.3	280.3			906.1	906.1
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (m)		20.0	57.0		58.0			35.0	70.0		
Storage Blk Time (%)	6	14	0				0			0	
Queuing Penalty (veh)	21	14	0				0			0	

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	3.1	37.2	8.9	45.8	8.8	13.1	14.7	20.7
Average Queue (m)	0.2	10.8	1.0	15.3	0.7	5.2	4.0	7.2
95th Queue (m)	2.0	27.4	5.6	34.1	4.6	12.5	11.4	16.3
Link Distance (m)		487.5		233.9		652.1		216.0
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	23.0		75.0		28.0		30.0	
Storage Blk Time (%)		1						0
Queuing Penalty (veh)		0						0

**Intersection: 3: Old Ellwood Drive & Station Road**

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	20.8	18.7	20.1
Average Queue (m)	12.3	9.3	9.8
95th Queue (m)	19.1	15.3	15.2
Link Distance (m)	499.4	192.0	652.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 4: Coleraine Drive & Old Ellwood Drive**

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (m)	39.1	16.9	16.2	70.6	108.4	112.7
Average Queue (m)	9.2	3.5	4.0	12.5	29.2	34.0
95th Queue (m)	26.5	11.4	12.3	40.2	96.3	100.4
Link Distance (m)	499.4	0.5	0.5		104.7	104.7
Upstream Blk Time (%)		3	2		7	8
Queuing Penalty (veh)		3	2		35	39
Storage Bay Dist (m)				20.0		
Storage Blk Time (%)				1	11	
Queuing Penalty (veh)				3	14	

**Intersection: 5: Coleraine Drive & Ellwood Drive West**

Movement	WB	SB	SB	SB
Directions Served	LR	L	T	T
Maximum Queue (m)	43.6	18.4	109.8	116.7
Average Queue (m)	13.8	0.6	12.0	13.3
95th Queue (m)	31.2	9.3	73.8	78.4
Link Distance (m)	268.5		280.3	280.3
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)		60.0		
Storage Blk Time (%)		0	4	
Queuing Penalty (veh)		0	0	

**Intersection: 6: Coleraine Drive**

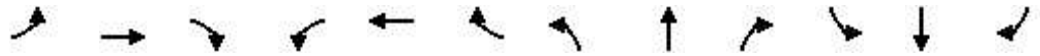
Movement	SE	SE	NW	NW
Directions Served	T	T	T	T
Maximum Queue (m)	8.9	5.8	30.5	31.7
Average Queue (m)	1.2	0.8	3.0	2.9
95th Queue (m)	5.9	4.2	17.7	18.0
Link Distance (m)	0.5	0.5	739.2	739.2
Upstream Blk Time (%)	9	9		
Queuing Penalty (veh)	39	40		
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Network Summary**

Network wide Queuing Penalty: 209

HCM Signalized Intersection Capacity Analysis  
 1: Coleraine Drive & Harvest Moon Drive/King Street West

2017 Existing Conditions  
 Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↖	↖	↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	6	105	148	55	94	189	363	543	164	164	133	9
Future Volume (vph)	6	105	148	55	94	189	363	543	164	164	133	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7
Total Lost time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1615	1725	1921	1593	1725	3411	1581	1707	2986	
Flt Permitted		0.96	1.00	0.61	1.00	1.00	0.59	1.00	1.00	0.42	1.00	
Satd. Flow (perm)		1748	1615	1101	1921	1593	1070	3411	1581	757	2986	
Peak-hour factor, PHF	0.38	0.80	0.80	0.86	0.78	0.84	0.95	0.91	0.76	0.80	0.90	0.32
Adj. Flow (vph)	16	131	185	64	121	225	382	597	216	205	148	28
RTOR Reduction (vph)	0	0	125	0	0	144	0	0	110	0	12	0
Lane Group Flow (vph)	0	147	60	64	121	81	382	597	106	205	164	0
Confl. Peds. (#/hr)	2					2			1	1		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	7%	1%	1%	23%	0%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		
Actuated Green, G (s)		31.9	31.9	39.6	39.6	39.6	56.1	41.8	41.8	45.8	34.5	
Effective Green, g (s)		31.9	31.9	39.6	39.6	39.6	56.1	41.8	41.8	45.8	34.5	
Actuated g/C Ratio		0.29	0.29	0.36	0.36	0.36	0.51	0.38	0.38	0.42	0.32	
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		509	470	425	695	576	660	1303	604	415	941	
v/s Ratio Prot				0.01	c0.06		c0.10	0.18		0.05	0.05	
v/s Ratio Perm		c0.08	0.04	0.05		0.05	c0.20		0.07	0.16		
v/c Ratio		0.29	0.13	0.15	0.17	0.14	0.58	0.46	0.18	0.49	0.17	
Uniform Delay, d1		30.0	28.5	23.2	23.8	23.5	16.7	25.3	22.4	21.0	27.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.4	0.6	0.2	0.5	0.5	1.2	0.3	0.1	0.9	0.4	
Delay (s)		31.4	29.1	23.3	24.3	24.0	18.0	25.6	22.5	21.9	27.5	
Level of Service		C	C	C	C	C	B	C	C	C	C	
Approach Delay (s)		30.1			24.0			22.6			24.5	
Approach LOS		C			C			C			C	

Intersection Summary		
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.47	C
Actuated Cycle Length (s)	109.4	Sum of lost time (s)
Intersection Capacity Utilization	62.4%	19.7
Analysis Period (min)	15	ICU Level of Service
		B
c Critical Lane Group		

# HCM Signalized Intersection Capacity Analysis

## 2: Station Road & King Street West

2017 Existing Conditions  
Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	389	12	29	313	19	11	15	28	9	5	14
Future Volume (vph)	32	389	12	29	313	19	11	15	28	9	5	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.90		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1803	1848		1805	1783		1805	1710		1805	1710	
Flt Permitted	0.54	1.00		0.51	1.00		0.73	1.00		0.72	1.00	
Satd. Flow (perm)	1028	1848		973	1783		1394	1710		1364	1710	
Peak-hour factor, PHF	0.89	0.94	0.75	0.56	0.93	0.59	0.55	0.75	0.70	0.56	0.42	0.58
Adj. Flow (vph)	36	414	16	52	337	32	20	20	40	16	12	24
RTOR Reduction (vph)	0	1	0	0	2	0	0	37	0	0	22	0
Lane Group Flow (vph)	36	429	0	52	367	0	20	23	0	16	14	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	0%	2%	8%	0%	5%	5%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	58.8	58.8		58.8	58.8		6.6	6.6		6.6	6.6	
Effective Green, g (s)	58.8	58.8		58.8	58.8		6.6	6.6		6.6	6.6	
Actuated g/C Ratio	0.75	0.75		0.75	0.75		0.08	0.08		0.08	0.08	
Clearance Time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	770	1384		728	1335		117	143		114	143	
v/s Ratio Prot		c0.23			0.21			0.01			0.01	
v/s Ratio Perm	0.04			0.05			c0.01			0.01		
v/c Ratio	0.05	0.31		0.07	0.27		0.17	0.16		0.14	0.10	
Uniform Delay, d1	2.6	3.2		2.6	3.1		33.4	33.4		33.3	33.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.6		0.2	0.5		0.7	0.5		0.6	0.3	
Delay (s)	2.7	3.8		2.8	3.6		34.1	33.9		33.9	33.5	
Level of Service	A	A		A	A		C	C		C	C	
Approach Delay (s)		3.7			3.5			34.0			33.6	
Approach LOS		A			A			C			C	

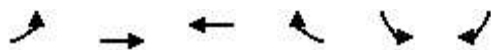
### Intersection Summary

HCM 2000 Control Delay	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	13.1
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 3: Old Ellwood Drive & Station Road

2017 Existing Conditions  
 Timing Plan: Weekday PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	15	145	243	113	56	5
Future Volume (vph)	15	145	243	113	56	5
Peak Hour Factor	0.63	0.76	0.86	0.94	0.78	0.42
Hourly flow rate (vph)	24	191	283	120	72	12

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	215	403	84
Volume Left (vph)	24	0	72
Volume Right (vph)	0	120	12
Hadj (s)	0.02	-0.15	0.09
Departure Headway (s)	4.6	4.2	5.3
Degree Utilization, x	0.27	0.47	0.12
Capacity (veh/h)	760	829	598
Control Delay (s)	9.3	11.0	9.1
Approach Delay (s)	9.3	11.0	9.1
Approach LOS	A	B	A

Intersection Summary			
Delay		10.2	
Level of Service		B	
Intersection Capacity Utilization	30.2%		ICU Level of Service A
Analysis Period (min)		15	



HCM Signalized Intersection Capacity Analysis  
4: Coleraine Drive & Old Ellwood Drive

2017 Existing Conditions  
Timing Plan: Weekday PM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	WT		WT		WT	WT
Traffic Volume (vph)	23	224	892	73	88	245
Future Volume (vph)	23	224	892	73	88	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		7.7		5.3	5.3
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.88		0.99		1.00	1.00
Flt Protected	1.00		1.00		0.95	1.00
Satd. Flow (prot)	1654		3435		1805	3139
Flt Permitted	1.00		1.00		0.21	1.00
Satd. Flow (perm)	1654		3435		400	3139
Peak-hour factor, PHF	0.72	0.77	0.86	0.76	0.76	0.97
Adj. Flow (vph)	32	291	1037	96	116	253
RTOR Reduction (vph)	64	0	9	0	0	0
Lane Group Flow (vph)	259	0	1124	0	116	253
Heavy Vehicles (%)	4%	0%	4%	1%	0%	15%
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	14.4		37.7		40.1	40.1
Effective Green, g (s)	14.4		37.7		40.1	40.1
Actuated g/C Ratio	0.22		0.57		0.60	0.60
Clearance Time (s)	6.5		7.7		5.3	5.3
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	359		1953		241	1898
v/s Ratio Prot	c0.16		c0.33			0.08
v/s Ratio Perm					0.29	
v/c Ratio	0.72		0.58		0.48	0.13
Uniform Delay, d1	24.1		9.2		7.3	5.6
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	7.0		1.2		6.7	0.1
Delay (s)	31.1		10.4		14.0	5.8
Level of Service	C		B		B	A
Approach Delay (s)	31.1		10.4			8.4
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	66.3	Sum of lost time (s)	14.2
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
5: Coleraine Drive & Ellwood Drive West

2017 Existing Conditions  
Timing Plan: Weekday PM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	16	1054	62	21	315
Future Volume (Veh/h)	18	16	1054	62	21	315
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.75	0.80	0.91	0.91	0.75	0.96
Hourly flow rate (vph)	24	20	1158	68	28	328
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage veh				2		
Upstream signal (m)	120			300		
pX, platoon unblocked	0.81	0.81			0.81	
vC, conflicting volume	1412	613			1226	
vC1, stage 1 conf vol	1192					
vC2, stage 2 conf vol	220					
vCu, unblocked vol	1032	42			801	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	98			96	
cM capacity (veh/h)	328	828			670	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	44	772	454	28	164	164
Volume Left	24	0	0	28	0	0
Volume Right	20	0	68	0	0	0
cSH	452	1700	1700	670	1700	1700
Volume to Capacity	0.10	0.45	0.27	0.04	0.10	0.10
Queue Length 95th (m)	2.6	0.0	0.0	1.0	0.0	0.0
Control Delay (s)	13.8	0.0	0.0	10.6	0.0	0.0
Lane LOS	B		B			
Approach Delay (s)	13.8	0.0		0.8		
Approach LOS	B					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			41.1%	ICU Level of Service	A	
Analysis Period (min)			15			

# HCM Signalized Intersection Capacity Analysis

## 6: Coleraine Drive

2017 Existing Conditions  
Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑			↑			↑↑			↑↑	
Traffic Volume (vph)	0	0	0	0	0	0	0	268	0	0	965	0
Future Volume (vph)	0	0	0	0	0	0	0	268	0	0	965	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)								4.5			4.5	
Lane Util. Factor								0.95			0.95	
Frt								1.00			1.00	
Flt Protected								1.00			1.00	
Satd. Flow (prot)								3539			3539	
Flt Permitted								1.00			1.00	
Satd. Flow (perm)								3539			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0	0	291	0	0	1049	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	291	0	0	1049	0
Turn Type								NA			NA	
Protected Phases		4			8			6			2	
Permitted Phases												
Actuated Green, G (s)								56.5			56.5	
Effective Green, g (s)								56.5			56.5	
Actuated g/C Ratio								0.72			0.72	
Clearance Time (s)								4.5			4.5	
Vehicle Extension (s)								3.0			3.0	
Lane Grp Cap (vph)								2534			2534	
v/s Ratio Prot								0.08			c0.30	
v/s Ratio Perm												
v/c Ratio								0.11			0.41	
Uniform Delay, d1								3.5			4.5	
Progression Factor								1.00			1.00	
Incremental Delay, d2								0.1			0.5	
Delay (s)								3.6			5.0	
Level of Service								A			A	
Approach Delay (s)		0.0			0.0			3.6			5.0	
Approach LOS		A			A			A			A	

### Intersection Summary

HCM 2000 Control Delay	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	78.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	2397	2490	2465	2383	2432	2430
Vehs Exited	2414	2497	2494	2381	2421	2441
Starting Vehs	88	98	149	92	77	98
Ending Vehs	71	91	120	94	88	91
Travel Distance (km)	3616	3793	3753	3623	3714	3700
Travel Time (hr)	93.9	98.3	94.6	90.7	96.7	94.8
Total Delay (hr)	23.5	24.4	21.2	19.9	24.6	22.7
Total Stops	2750	2869	2735	2667	2843	2770
Fuel Used (l)	289.1	302.0	299.3	288.4	299.1	295.6

Interval #0 Information Seeding

Start Time	6:30
End Time	7:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:00
End Time	8:00
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	2397	2490	2465	2383	2432	2430
Vehs Exited	2414	2497	2494	2381	2421	2441
Starting Vehs	88	98	149	92	77	98
Ending Vehs	71	91	120	94	88	91
Travel Distance (km)	3616	3793	3753	3623	3714	3700
Travel Time (hr)	93.9	98.3	94.6	90.7	96.7	94.8
Total Delay (hr)	23.5	24.4	21.2	19.9	24.6	22.7
Total Stops	2750	2869	2735	2667	2843	2770
Fuel Used (l)	289.1	302.0	299.3	288.4	299.1	295.6

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	L	T	T	R	L	T	TR
Maximum Queue (m)	45.7	22.3	28.6	28.8	57.8	109.8	83.5	30.9	46.9	30.3	33.7
Average Queue (m)	16.8	10.9	8.1	10.2	42.6	37.9	36.2	12.9	23.7	15.2	13.5
95th Queue (m)	34.0	18.5	20.0	23.6	64.0	74.1	61.1	23.9	38.5	28.8	28.8
Link Distance (m)	235.7		487.5		280.3		280.3		906.1		906.1
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (m)	20.0		57.0		58.0		35.0		70.0		
Storage Blk Time (%)	9	0			3	1	9	0			
Queuing Penalty (veh)	13	1			8	5	15	0			

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	10.4	49.0	16.2	39.1	9.1	19.7	11.2	10.1
Average Queue (m)	3.2	15.5	3.7	13.1	2.6	6.5	2.5	3.6
95th Queue (m)	9.7	37.5	11.8	29.7	9.1	15.5	8.8	10.5
Link Distance (m)	487.5		233.9		652.1		216.0	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	23.0	75.0		28.0		30.0		
Storage Blk Time (%)	2							
Queuing Penalty (veh)	1							

**Intersection: 3: Old Ellwood Drive & Station Road**

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	17.8	34.1	16.2
Average Queue (m)	11.7	16.8	8.5
95th Queue (m)	17.6	25.4	14.5
Link Distance (m)	500.7	192.0	652.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 4: Coleraine Drive & Old Ellwood Drive**

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (m)	45.0	24.1	19.1	31.2	33.9	36.7
Average Queue (m)	17.7	10.4	13.5	12.8	7.1	10.9
95th Queue (m)	33.3	17.6	19.9	25.2	22.8	25.3
Link Distance (m)	500.7	1.0	1.0		104.7	104.7
Upstream Blk Time (%)		21	19			
Queuing Penalty (veh)		102	93			
Storage Bay Dist (m)				20.0		
Storage Blk Time (%)				4	2	
Queuing Penalty (veh)				5	2	

**Intersection: 5: Coleraine Drive & Ellwood Drive West**

Movement	WB	SB
Directions Served	LR	L
Maximum Queue (m)	19.1	11.6
Average Queue (m)	6.9	3.3
95th Queue (m)	15.1	10.7
Link Distance (m)	268.5	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		60.0
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Intersection: 6: Coleraine Drive**

Movement	SE	SE	NW	NW
Directions Served	T	T	T	T
Maximum Queue (m)	4.0	4.4	135.2	138.3
Average Queue (m)	0.2	0.3	25.8	24.5
95th Queue (m)	2.4	2.2	86.7	88.3
Link Distance (m)	1.0	1.0	711.8	711.8
Upstream Blk Time (%)	3	3		
Queuing Penalty (veh)	4	4		
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Network Summary**

Network wide Queuing Penalty: 252

Timings

1: Coleraine Drive & Harvest Moon Drive/King Street West

2041 Do Nothing

Timing Plan: Weekday AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↖	↗	↖	↖	↗	↖	↖	↗	↖	↖
Traffic Volume (vph)	4	96	364	516	35	431	43	215	91	299	944
Future Volume (vph)	4	96	364	516	35	431	43	215	91	299	944
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		8		7	4		1	6		5	2
Permitted Phases	8		8	4		4	6		6	2	
Detector Phase	8	8	8	7	4	4	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	8.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0
Minimum Split (s)	41.1	41.1	41.1	8.0	41.1	41.1	8.0	37.6	37.6	8.0	37.6
Total Split (s)	41.1	41.1	41.1	24.0	65.1	65.1	8.0	39.9	39.9	15.0	46.9
Total Split (%)	34.3%	34.3%	34.3%	20.0%	54.3%	54.3%	6.7%	33.3%	33.3%	12.5%	39.1%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	3.1	3.1	3.1	0.0	3.1	3.1	0.0	2.6	2.6	0.0	2.6
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	None	Max	Max	None	None	None	None	Max

Intersection Summary

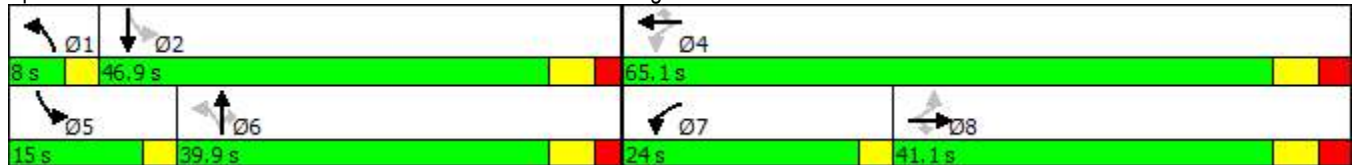
Cycle Length: 120

Actuated Cycle Length: 118.4

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Coleraine Drive & Harvest Moon Drive/King Street West



Timings  
2: Station Road & King Street West

2041 Do Nothing  
Timing Plan: Weekday AM Peak



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↗	↖	↗
Traffic Volume (vph)	2	479	9	937	3	5	18	9
Future Volume (vph)	2	479	9	937	3	5	18	9
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		2		4		4
Permitted Phases	2		2		4		4	
Detector Phase	2	2	2	2	4	4	4	4
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	27.1	27.1	27.1	27.1	30.0	30.0	30.0	30.0
Total Split (s)	60.0	60.0	60.0	60.0	30.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	3.1	3.1	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.1	7.1	7.1	7.1	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	None	None	None	None

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 80.6  
 Natural Cycle: 100  
 Control Type: Semi Act-Uncoord

Splits and Phases: 2: Station Road & King Street West





Timings  
4: Coleraine Drive & Old Ellwood Drive

2041 Do Nothing  
Timing Plan: Weekday AM Peak



Lane Group	WBL	NBT	SBL	SBT
Lane Configurations				
Traffic Volume (vph)	89	269	230	1652
Future Volume (vph)	89	269	230	1652
Turn Type	Prot	NA	pm+pt	NA
Protected Phases	8	2	1	6
Permitted Phases			6	
Detector Phase	8	2	1	6
Switch Phase				
Minimum Initial (s)	5.0	5.0	5.0	5.0
Minimum Split (s)	24.5	25.7	9.5	23.6
Total Split (s)	24.5	40.3	15.2	55.5
Total Split (%)	30.6%	50.4%	19.0%	69.4%
Yellow Time (s)	3.7	3.9	3.5	3.2
All-Red Time (s)	2.8	3.8	1.0	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	7.7	4.5	5.3
Lead/Lag		Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	
Recall Mode	None	Max	None	Max

Intersection Summary

Cycle Length: 80  
 Actuated Cycle Length: 75.1  
 Natural Cycle: 80  
 Control Type: Semi Act-Uncoord

Splits and Phases: 4: Coleraine Drive & Old Ellwood Drive



Timings  
6: Coleraine Drive

2041 Do Nothing  
Timing Plan: Weekday AM Peak



Lane Group	SET	NWT	Ø4	Ø8
Lane Configurations	↑↑	↑↑		
Traffic Volume (vph)	1741	349		
Future Volume (vph)	1741	349		
Turn Type	NA	NA		
Protected Phases	6	2	4	8
Permitted Phases				
Detector Phase	6	2		
Switch Phase				
Minimum Initial (s)	5.0	5.0	195.0	195.0
Minimum Split (s)	22.5	22.5	199.5	199.5
Total Split (s)	25.5	25.5	204.5	199.5
Total Split (%)	11.1%	11.1%	89%	87%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		
Total Lost Time (s)	4.5	4.5		
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	Max	Max	None	None

Intersection Summary
























Cycle Length: 230  
 Actuated Cycle Length: 77.4  
 Natural Cycle: 225  
 Control Type: Semi Act-Uncoord

Splits and Phases: 6: Coleraine Drive



HCM Signalized Intersection Capacity Analysis  
 1: Coleraine Drive & Harvest Moon Drive/King Street West

2041 Do Nothing  
 Timing Plan: Weekday AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	96	364	516	35	431	43	215	91	299	944	5
Future Volume (vph)	4	96	364	516	35	431	43	215	91	299	944	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7
Total Lost time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1659	1568	1675	1812	1601	1691	2874	1526	1725	3228	
Flt Permitted		0.98	1.00	0.62	1.00	1.00	0.14	1.00	1.00	0.52	1.00	
Satd. Flow (perm)		1639	1568	1097	1812	1601	257	2874	1526	944	3228	
Peak-hour factor, PHF	0.50	0.83	0.95	0.88	0.58	0.83	0.83	0.79	0.85	0.84	0.98	0.63
Adj. Flow (vph)	8	116	383	586	60	519	52	272	107	356	963	8
RTOR Reduction (vph)	0	0	109	0	0	242	0	0	78	0	1	0
Lane Group Flow (vph)	0	124	274	586	60	277	52	272	29	356	970	0
Heavy Vehicles (%)	25%	8%	3%	3%	6%	2%	2%	27%	7%	0%	13%	4%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		
Actuated Green, G (s)		34.0	34.0	58.0	58.0	58.0	36.1	32.2	32.2	47.2	40.3	
Effective Green, g (s)		34.0	34.0	58.0	58.0	58.0	36.1	32.2	32.2	47.2	40.3	
Actuated g/C Ratio		0.29	0.29	0.49	0.49	0.49	0.30	0.27	0.27	0.40	0.34	
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		468	448	637	883	780	125	778	413	453	1094	
v/s Ratio Prot				c0.16	0.03		0.01	0.09		c0.08	c0.30	
v/s Ratio Perm		0.08	0.18	c0.29		0.17	0.11		0.02	0.23		
v/c Ratio		0.26	0.61	0.92	0.07	0.36	0.42	0.35	0.07	0.79	0.89	
Uniform Delay, d1		32.8	36.7	26.0	16.1	18.9	31.0	34.9	32.2	29.3	37.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.4	6.1	18.4	0.1	1.3	2.2	0.3	0.1	8.7	10.7	
Delay (s)		34.2	42.9	44.4	16.3	20.1	33.2	35.2	32.3	38.0	47.8	
Level of Service		C	D	D	B	C	C	D	C	D	D	
Approach Delay (s)		40.8			32.1			34.2			45.2	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	38.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	118.9	Sum of lost time (s)	19.7
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 2: Station Road & King Street West

2041 Do Nothing  
Timing Plan: Weekday AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	2	479	5	9	937	3	3	5	25	18	9	42
Future Volume (vph)	2	479	5	9	937	3	3	5	25	18	9	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.90		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1823		1805	1843		1805	1706		1805	1628	
Flt Permitted	0.09	1.00		0.39	1.00		0.52	1.00		0.73	1.00	
Satd. Flow (perm)	168	1823		740	1843		980	1706		1380	1628	
Peak-hour factor, PHF	0.50	0.80	0.42	0.50	0.82	0.38	0.38	0.33	0.78	0.64	0.38	0.25
Adj. Flow (vph)	4	599	12	18	1143	8	8	15	32	28	24	168
RTOR Reduction (vph)	0	1	0	0	0	0	0	27	0	0	69	0
Lane Group Flow (vph)	4	610	0	18	1151	0	8	20	0	28	123	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%	0%	0%	0%	0%	11%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	55.8	55.8		55.8	55.8		11.7	11.7		11.7	11.7	
Effective Green, g (s)	55.8	55.8		55.8	55.8		11.7	11.7		11.7	11.7	
Actuated g/C Ratio	0.69	0.69		0.69	0.69		0.15	0.15		0.15	0.15	
Clearance Time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	116	1262		512	1275		142	247		200	236	
v/s Ratio Prot		0.33			c0.62			0.01			c0.08	
v/s Ratio Perm	0.02			0.02			0.01			0.02		
v/c Ratio	0.03	0.48		0.04	0.90		0.06	0.08		0.14	0.52	
Uniform Delay, d1	3.9	5.7		3.9	10.2		29.7	29.8		30.1	31.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	1.3		0.1	10.5		0.2	0.1		0.3	2.1	
Delay (s)	4.5	7.1		4.0	20.7		29.9	29.9		30.4	33.9	
Level of Service	A	A		A	C		C	C		C	C	
Approach Delay (s)		7.0			20.5			29.9			33.5	
Approach LOS		A			C			C			C	

### Intersection Summary

HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	80.6	Sum of lost time (s)	13.1
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 3: Old Ellwood Drive & Station Road

2041 Do Nothing  
 Timing Plan: Weekday AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↘	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	1	310	152	11	69	17
Future Volume (vph)	1	310	152	11	69	17
Peak Hour Factor	0.25	0.84	0.77	0.39	0.72	0.71
Hourly flow rate (vph)	4	369	197	28	96	24

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	373	225	120
Volume Left (vph)	4	0	96
Volume Right (vph)	0	28	24
Hadj (s)	0.04	-0.06	0.09
Departure Headway (s)	4.5	4.6	5.4
Degree Utilization, x	0.47	0.29	0.18
Capacity (veh/h)	763	746	601
Control Delay (s)	11.5	9.5	9.5
Approach Delay (s)	11.5	9.5	9.5
Approach LOS	B	A	A

Intersection Summary			
Delay		10.5	
Level of Service		B	
Intersection Capacity Utilization	28.6%		ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
4: Coleraine Drive & Old Ellwood Drive

2041 Do Nothing  
Timing Plan: Weekday AM Peak















Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙		↑↑		↘	↑↑
Traffic Volume (vph)	89	80	269	80	230	1652
Future Volume (vph)	89	80	269	80	230	1652
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		7.7		4.5	5.3
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.94		0.96		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1651		2782		1787	3471
Flt Permitted	0.97		1.00		0.44	1.00
Satd. Flow (perm)	1651		2782		834	3471
Peak-hour factor, PHF	0.73	0.88	0.84	0.68	0.82	0.83
Adj. Flow (vph)	122	91	320	118	280	1990
RTOR Reduction (vph)	36	0	43	0	0	0
Lane Group Flow (vph)	177	0	395	0	280	1990
Heavy Vehicles (%)	2%	10%	31%	7%	1%	4%
Turn Type	Prot		NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases					6	
Actuated Green, G (s)	12.9		34.1		50.3	50.3
Effective Green, g (s)	12.9		34.1		50.3	50.3
Actuated g/C Ratio	0.17		0.45		0.67	0.67
Clearance Time (s)	6.5		7.7		4.5	5.3
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	283		1264		677	2327
v/s Ratio Prot	c0.11		0.14		0.05	c0.57
v/s Ratio Perm					0.23	
v/c Ratio	0.63		0.31		0.41	0.86
Uniform Delay, d1	28.8		13.0		5.0	9.5
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	4.3		0.6		0.4	4.3
Delay (s)	33.1		13.6		5.4	13.8
Level of Service	C		B		A	B
Approach Delay (s)	33.1		13.6			12.8
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	18.7
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
5: Coleraine Drive & Ellwood Drive West

2041 Do Nothing  
Timing Plan: Weekday AM Peak

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations			 			 
Traffic Volume (veh/h)	64	25	324	4	6	1818
Future Volume (Veh/h)	64	25	324	4	6	1818
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.64	0.89	0.85	0.33	0.38	0.87
Hourly flow rate (vph)	100	28	381	12	16	2090
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage veh				2		
Upstream signal (m)	120			300		
pX, platoon unblocked	0.73					
vC, conflicting volume	1464	196			393	
vC1, stage 1 conf vol	387					
vC2, stage 2 conf vol	1077					
vCu, unblocked vol	885	196			393	
tC, single (s)	6.8	7.0			4.8	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.5	
p0 queue free %	76	97			98	
cM capacity (veh/h)	422	806			969	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	128	254	139	16	1045	1045
Volume Left	100	0	0	16	0	0
Volume Right	28	0	12	0	0	0
cSH	471	1700	1700	969	1700	1700
Volume to Capacity	0.27	0.15	0.08	0.02	0.61	0.61
Queue Length 95th (m)	8.7	0.0	0.0	0.4	0.0	0.0
Control Delay (s)	15.5	0.0	0.0	8.8	0.0	0.0
Lane LOS	C			A		
Approach Delay (s)	15.5	0.0			0.1	
Approach LOS	C					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			62.0%		ICU Level of Service	B
Analysis Period (min)			15			

# HCM Signalized Intersection Capacity Analysis

## 6: Coleraine Drive

2041 Do Nothing  
Timing Plan: Weekday AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑			↑			↑↑			↑↑	
Traffic Volume (vph)	0	0	0	0	0	0	0	1741	0	0	349	0
Future Volume (vph)	0	0	0	0	0	0	0	1741	0	0	349	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)								4.5			4.5	
Lane Util. Factor								0.95			0.95	
Frt								1.00			1.00	
Flt Protected								1.00			1.00	
Satd. Flow (prot)								3539			3539	
Flt Permitted								1.00			1.00	
Satd. Flow (perm)								3539			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0	0	1892	0	0	379	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	0	0	0	1892	0	0	379	0
Turn Type								NA			NA	
Protected Phases		4			8			6			2	
Permitted Phases												
Actuated Green, G (s)								56.5			56.5	
Effective Green, g (s)								56.5			56.5	
Actuated g/C Ratio								0.72			0.72	
Clearance Time (s)								4.5			4.5	
Vehicle Extension (s)								3.0			3.0	
Lane Grp Cap (vph)								2534			2534	
v/s Ratio Prot								c0.53			0.11	
v/s Ratio Perm												
v/c Ratio								0.75			0.15	
Uniform Delay, d1								6.8			3.6	
Progression Factor								1.00			1.00	
Incremental Delay, d2								2.1			0.1	
Delay (s)								8.9			3.7	
Level of Service								A			A	
Approach Delay (s)		0.0			0.0			8.9			3.7	
Approach LOS		A			A			A			A	

### Intersection Summary

HCM 2000 Control Delay	8.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	78.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	6:45	6:45	6:45	6:45	6:45	6:45
End Time	8:15	8:15	8:15	8:15	8:15	8:15
Total Time (min)	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1
Vehs Entered	3665	3670	3602	3663	3693	3657
Vehs Exited	3660	3629	3629	3506	3682	3622
Starting Vehs	165	162	176	152	160	159
Ending Vehs	170	203	149	309	171	197
Travel Distance (km)	6008	5964	5969	5878	6071	5978
Travel Time (hr)	177.5	197.4	161.3	168.4	169.4	174.8
Total Delay (hr)	64.4	85.4	49.2	57.7	55.1	62.3
Total Stops	4659	5512	4036	4287	4403	4580
Fuel Used (l)	503.8	514.6	486.7	483.6	503.3	498.4

Interval #0 Information Seeding

Start Time	6:45
End Time	7:15
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	7:15
End Time	8:15
Total Time (min)	60
Volumes adjusted by Growth Factors.	

Run Number	1	2	3	4	5	Avg
Vehs Entered	3665	3670	3602	3663	3693	3657
Vehs Exited	3660	3629	3629	3506	3682	3622
Starting Vehs	165	162	176	152	160	159
Ending Vehs	170	203	149	309	171	197
Travel Distance (km)	6008	5964	5969	5878	6071	5978
Travel Time (hr)	177.5	197.4	161.3	168.4	169.4	174.8
Total Delay (hr)	64.4	85.4	49.2	57.7	55.1	62.3
Total Stops	4659	5512	4036	4287	4403	4580
Fuel Used (l)	503.8	514.6	486.7	483.6	503.3	498.4

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	R	L	T	T	R	L	T	TR
Maximum Queue (m)	82.7	83.0	155.9	194.8	33.2	30.9	64.3	57.8	25.3	136.9	166.8	178.6
Average Queue (m)	23.6	43.6	93.3	39.2	1.1	11.0	29.6	24.3	10.6	59.1	87.6	93.0
95th Queue (m)	57.2	76.5	153.9	234.6	19.0	25.2	52.3	45.6	20.5	104.6	136.2	144.7
Link Distance (m)	235.7		487.5			280.3		280.3		906.1		906.1
Upstream Blk Time (%)	0											
Queuing Penalty (veh)	2											
Storage Bay Dist (m)	20.0		57.0		60.0		58.0		35.0		70.0	
Storage Blk Time (%)	14	40	37				1	4	6		17	
Queuing Penalty (veh)	49	40	174				0	3	30		51	

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	6.2	58.2	8.9	112.0	8.4	14.4	12.6	26.1
Average Queue (m)	0.3	19.8	1.6	49.1	0.6	5.4	3.6	8.8
95th Queue (m)	2.6	45.2	7.0	92.3	4.6	13.4	10.6	19.2
Link Distance (m)	487.5		233.9		652.1		216.0	
Upstream Blk Time (%)	0							
Queuing Penalty (veh)	0							
Storage Bay Dist (m)	23.0		75.0		28.0		30.0	
Storage Blk Time (%)	4		2				0	
Queuing Penalty (veh)	0		0				0	

**Intersection: 3: Old Ellwood Drive & Station Road**

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	31.3	20.1	23.0
Average Queue (m)	16.7	11.4	10.3
95th Queue (m)	25.2	17.6	18.1
Link Distance (m)	499.4	192.0	652.1
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)	0		
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

**Intersection: 4: Coleraine Drive & Old Ellwood Drive**

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (m)	68.5	15.2	16.0	79.7	118.2	114.4
Average Queue (m)	24.1	7.1	10.7	21.5	49.1	54.7
95th Queue (m)	52.2	13.8	19.3	52.4	104.7	108.3
Link Distance (m)	499.4	0.5	0.5		104.7	104.7
Upstream Blk Time (%)		15	12		5	6
Queuing Penalty (veh)		26	21		49	54
Storage Bay Dist (m)				20.0		
Storage Blk Time (%)				4	15	
Queuing Penalty (veh)				35	35	

**Intersection: 5: Coleraine Drive & Ellwood Drive West**

Movement	WB	SB	SB	SB
Directions Served	LR	L	T	T
Maximum Queue (m)	89.5	20.8	170.4	172.8
Average Queue (m)	27.7	1.2	21.3	22.0
95th Queue (m)	71.2	13.2	132.8	135.3
Link Distance (m)	268.5		280.3	280.3
Upstream Blk Time (%)			1	1
Queuing Penalty (veh)			6	9
Storage Bay Dist (m)		60.0		
Storage Blk Time (%)		0	4	
Queuing Penalty (veh)		0	0	

**Intersection: 6: Coleraine Drive**

Movement	SE	SE	NW	NW
Directions Served	T	T	T	T
Maximum Queue (m)	8.1	6.7	49.5	55.5
Average Queue (m)	0.7	0.7	5.8	7.3
95th Queue (m)	4.5	4.1	27.1	32.8
Link Distance (m)	0.5	0.5	739.2	739.2
Upstream Blk Time (%)	4	4		
Queuing Penalty (veh)	39	38		
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

**Network Summary**

Network wide Queuing Penalty: 664

Timings  
1: Coleraine Drive & Harvest Moon Drive/King Street West

2041Do Nothing  
Timing Plan: Weekday PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↖	↗	↖	↖	↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	6	105	148	156	94	537	363	873	264	347	353
Future Volume (vph)	6	105	148	156	94	537	363	873	264	347	353
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		8		7	4		1	6		5	2
Permitted Phases	8		8	4		4	6		6	2	
Detector Phase	8	8	8	7	4	4	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	8.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0
Minimum Split (s)	32.1	32.1	32.1	8.0	32.1	32.1	8.0	34.6	34.6	8.0	34.6
Total Split (s)	34.0	34.0	34.0	15.0	49.0	49.0	26.0	54.0	54.0	37.0	65.0
Total Split (%)	24.3%	24.3%	24.3%	10.7%	35.0%	35.0%	18.6%	38.6%	38.6%	26.4%	46.4%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	3.1	3.1	3.1	0.0	3.1	3.1	0.0	2.6	2.6	0.0	2.6
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	None	Max	Max	None	None	None	None	Max

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 136.5

Natural Cycle: 95

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Coleraine Drive & Harvest Moon Drive/King Street West



# HCM Signalized Intersection Capacity Analysis

## 1: Coleraine Drive & Harvest Moon Drive/King Street West

2041Do Nothing  
Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↖	↗	↖	↖	↗	↖	↖	↖
Traffic Volume (vph)	6	105	148	156	94	537	363	873	264	347	353	9
Future Volume (vph)	6	105	148	156	94	537	363	873	264	347	353	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7
Total Lost time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1805	1615	1725	1921	1592	1725	3411	1581	1708	2975	
Flt Permitted		0.96	1.00	0.54	1.00	1.00	0.51	1.00	1.00	0.11	1.00	
Satd. Flow (perm)		1739	1615	980	1921	1592	920	3411	1581	202	2975	
Peak-hour factor, PHF	0.38	0.80	0.80	0.86	0.78	0.84	0.95	0.91	0.76	0.80	0.90	0.32
Adj. Flow (vph)	16	131	185	181	121	639	382	959	347	434	392	28
RTOR Reduction (vph)	0	0	112	0	0	308	0	0	94	0	3	0
Lane Group Flow (vph)	0	147	73	181	121	331	382	959	253	434	417	0
Confl. Peds. (#/hr)	2					2			1	1		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	7%	1%	1%	23%	0%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		
Actuated Green, G (s)		27.2	27.2	41.9	41.9	41.9	65.9	47.1	47.1	80.9	59.1	
Effective Green, g (s)		27.2	27.2	41.9	41.9	41.9	65.9	47.1	47.1	80.9	59.1	
Actuated g/C Ratio		0.20	0.20	0.31	0.31	0.31	0.48	0.35	0.35	0.59	0.43	
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		346	321	364	589	488	555	1176	545	459	1288	
v/s Ratio Prot				0.04	0.06		0.09	0.28		c0.21	0.14	
v/s Ratio Perm		0.08	0.05	0.11		c0.21	0.24		0.16	c0.35		
v/c Ratio		0.42	0.23	0.50	0.21	0.68	0.69	0.82	0.46	0.95	0.32	
Uniform Delay, d1		47.8	45.8	36.8	35.0	41.4	23.5	40.7	34.9	38.3	25.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		3.8	1.6	1.1	0.8	7.4	3.5	4.5	0.6	28.5	0.7	
Delay (s)		51.6	47.5	37.8	35.8	48.8	27.0	45.2	35.5	66.8	26.2	
Level of Service		D	D	D	D	D	C	D	D	E	C	
Approach Delay (s)		49.3			45.0			39.1			46.8	
Approach LOS		D			D			D			D	

### Intersection Summary

HCM 2000 Control Delay	43.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	136.5	Sum of lost time (s)	19.7
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Timings  
2: Station Road & King Street West

2041Do Nothing  
Timing Plan: Weekday PM Peak



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↶	↷	↶	↷	↶	↷	↶	↷
Traffic Volume (vph)	32	672	29	762	11	15	9	5
Future Volume (vph)	32	672	29	762	11	15	9	5
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		2		4		4
Permitted Phases	2		2		4		4	
Detector Phase	2	2	2	2	4	4	4	4
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	26.1	26.1	26.1	26.1	28.0	28.0	28.0	28.0
Total Split (s)	59.0	59.0	59.0	59.0	31.0	31.0	31.0	31.0
Total Split (%)	65.6%	65.6%	65.6%	65.6%	34.4%	34.4%	34.4%	34.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	3.1	3.1	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.1	7.1	7.1	7.1	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	Max	Max	Max	Max	None	None	None	None

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 77.2  
 Natural Cycle: 75  
 Control Type: Semi Act-Uncoord

Splits and Phases: 2: Station Road & King Street West



# HCM Signalized Intersection Capacity Analysis

## 2: Station Road & King Street West

2041Do Nothing  
Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	32	672	12	29	762	19	11	15	28	9	5	14
Future Volume (vph)	32	672	12	29	762	19	11	15	28	9	5	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.90		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1804	1854		1805	1798		1805	1710		1805	1710	
Flt Permitted	0.28	1.00		0.35	1.00		0.73	1.00		0.72	1.00	
Satd. Flow (perm)	540	1854		657	1798		1394	1710		1364	1710	
Peak-hour factor, PHF	0.89	0.94	0.75	0.56	0.93	0.59	0.55	0.75	0.70	0.56	0.42	0.58
Adj. Flow (vph)	36	715	16	52	819	32	20	20	40	16	12	24
RTOR Reduction (vph)	0	1	0	0	1	0	0	37	0	0	22	0
Lane Group Flow (vph)	36	730	0	52	850	0	20	23	0	16	14	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	0%	2%	8%	0%	5%	5%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			4			4	
Permitted Phases	2			2			4			4		
Actuated Green, G (s)	58.8	58.8		58.8	58.8		6.6	6.6		6.6	6.6	
Effective Green, g (s)	58.8	58.8		58.8	58.8		6.6	6.6		6.6	6.6	
Actuated g/C Ratio	0.75	0.75		0.75	0.75		0.08	0.08		0.08	0.08	
Clearance Time (s)	7.1	7.1		7.1	7.1		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	404	1388		492	1346		117	143		114	143	
v/s Ratio Prot		0.39			c0.47			0.01			0.01	
v/s Ratio Perm	0.07			0.08			c0.01			0.01		
v/c Ratio	0.09	0.53		0.11	0.63		0.17	0.16		0.14	0.10	
Uniform Delay, d1	2.6	4.1		2.7	4.7		33.4	33.4		33.3	33.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	1.4		0.4	2.3		0.7	0.5		0.6	0.3	
Delay (s)	3.1	5.5		3.1	7.0		34.1	33.9		33.9	33.5	
Level of Service	A	A		A	A		C	C		C	C	
Approach Delay (s)		5.4			6.7			34.0			33.6	
Approach LOS		A			A			C			C	

### Intersection Summary

HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	78.5	Sum of lost time (s)	13.1
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 3: Old Ellwood Drive & Station Road

2041 Do Nothing  
 Timing Plan: Weekday PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	15	256	327	113	56	5
Future Volume (vph)	15	256	327	113	56	5
Peak Hour Factor	0.63	0.76	0.86	0.94	0.78	0.42
Hourly flow rate (vph)	24	337	380	120	72	12

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	361	500	84
Volume Left (vph)	24	0	72
Volume Right (vph)	0	120	12
Hadj (s)	0.01	-0.12	0.09
Departure Headway (s)	4.7	4.5	5.9
Degree Utilization, x	0.47	0.62	0.14
Capacity (veh/h)	731	788	531
Control Delay (s)	11.9	14.4	9.8
Approach Delay (s)	11.9	14.4	9.8
Approach LOS	B	B	A

Intersection Summary			
Delay		13.1	
Level of Service		B	
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)		15	



Timings  
4: Coleraine Drive & Old Ellwood Drive

2041Do Nothing  
Timing Plan: Weekday PM Peak



Lane Group	WBL	NBT	SBL	SBT
Lane Configurations	↘	↑	↙	↑↑
Traffic Volume (vph)	31	1245	174	483
Future Volume (vph)	31	1245	174	483
Turn Type	Prot	NA	pm+pt	NA
Protected Phases	8	2	1	6
Permitted Phases			6	
Detector Phase	8	2	1	6
Switch Phase				
Minimum Initial (s)	5.0	5.0	5.0	5.0
Minimum Split (s)	24.5	25.7	9.5	23.3
Total Split (s)	26.0	58.0	16.0	74.0
Total Split (%)	26.0%	58.0%	16.0%	74.0%
Yellow Time (s)	3.7	3.9	3.5	3.2
All-Red Time (s)	2.8	3.8	1.0	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	7.7	4.5	5.3
Lead/Lag		Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	
Recall Mode	None	Max	None	Max

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 97.9  
 Natural Cycle: 90  
 Control Type: Semi Act-Uncoord

Splits and Phases: 4: Coleraine Drive & Old Ellwood Drive



# HCM Signalized Intersection Capacity Analysis

## 4: Coleraine Drive & Old Ellwood Drive

2041Do Nothing  
Timing Plan: Weekday PM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	31	301	1245	98	174	483
Future Volume (vph)	31	301	1245	98	174	483
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.5		7.7		4.5	5.3
Lane Util. Factor	1.00		0.95		1.00	0.95
Frt	0.88		0.99		1.00	1.00
Flt Protected	1.00		1.00		0.95	1.00
Satd. Flow (prot)	1654		3437		1805	3139
Flt Permitted	1.00		1.00		0.07	1.00
Satd. Flow (perm)	1654		3437		131	3139
Peak-hour factor, PHF	0.72	0.77	0.86	0.76	0.76	0.97
Adj. Flow (vph)	43	391	1448	129	229	498
RTOR Reduction (vph)	182	0	6	0	0	0
Lane Group Flow (vph)	252	0	1571	0	229	498
Heavy Vehicles (%)	4%	0%	4%	1%	0%	15%
Turn Type	Prot		NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases					6	
Actuated Green, G (s)	17.3		51.1		68.8	68.8
Effective Green, g (s)	17.3		51.1		68.8	68.8
Actuated g/C Ratio	0.18		0.52		0.70	0.70
Clearance Time (s)	6.5		7.7		4.5	5.3
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	292		1793		276	2205
v/s Ratio Prot	c0.15		0.46		c0.09	0.16
v/s Ratio Perm					c0.49	
v/c Ratio	0.86		0.88		0.83	0.23
Uniform Delay, d1	39.2		20.6		27.5	5.1
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	22.2		6.4		18.3	0.2
Delay (s)	61.3		27.0		45.7	5.4
Level of Service	E		C		D	A
Approach Delay (s)	61.3		27.0			18.1
Approach LOS	E		C			B

### Intersection Summary

HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	97.9	Sum of lost time (s)	18.7
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

# HCM Unsignalized Intersection Capacity Analysis

## 5: Coleraine Drive & Ellwood Drive West

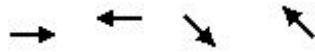
2041 Do Nothing  
Timing Plan: Weekday PM Peak



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	18	16	1484	62	21	636
Future Volume (Veh/h)	18	16	1484	62	21	636
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.75	0.80	0.91	0.91	0.75	0.96
Hourly flow rate (vph)	24	20	1631	68	28	663
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage (veh)				2		
Upstream signal (m)	120			300		
pX, platoon unblocked	0.62	0.60			0.60	
vC, conflicting volume	2052	850			1699	
vC1, stage 1 conf vol	1665					
vC2, stage 2 conf vol	388					
vCu, unblocked vol	1230	0			838	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	97			94	
cM capacity (veh/h)	237	656			484	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	44	1087	612	28	332	332
Volume Left	24	0	0	28	0	0
Volume Right	20	0	68	0	0	0
cSH	334	1700	1700	484	1700	1700
Volume to Capacity	0.13	0.64	0.36	0.06	0.20	0.20
Queue Length 95th (m)	3.6	0.0	0.0	1.5	0.0	0.0
Control Delay (s)	17.4	0.0	0.0	12.9	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	17.4	0.0			0.5	
Approach LOS	C					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			53.0%		ICU Level of Service	A
Analysis Period (min)			15			

Timings  
6: Coleraine Drive

2041Do Nothing  
Timing Plan: Weekday PM Peak



Lane Group	EBT	WBT	SET	NWT
Lane Configurations	↑	↑	↑↑	↑↑
Traffic Volume (vph)	1	1	514	1343
Future Volume (vph)	1	1	514	1343
Turn Type	NA	NA	NA	NA
Protected Phases	4	8	6	2
Permitted Phases				
Detector Phase	4	8	6	2
Switch Phase				
Minimum Initial (s)	195.0	195.0	5.0	5.0
Minimum Split (s)	199.5	199.5	22.5	22.5
Total Split (s)	199.5	199.5	25.5	25.5
Total Split (%)	88.7%	88.7%	11.3%	11.3%
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	Max	Max

Intersection Summary

Cycle Length: 225  
 Actuated Cycle Length: 77.4  
 Natural Cycle: 225  
 Control Type: Semi Act-Uncoord

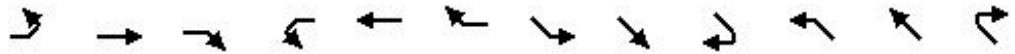
Splits and Phases: 6: Coleraine Drive

Ø2	Ø4
25.5 s	199.5 s
Ø6	Ø8
25.5 s	199.5 s

# HCM Signalized Intersection Capacity Analysis

## 6: Coleraine Drive

2041 Do Nothing  
Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↑			↑			↑↑			↑↑	
Traffic Volume (vph)	0	1	0	0	1	0	0	514	0	0	1343	0
Future Volume (vph)	0	1	0	0	1	0	0	514	0	0	1343	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5			4.5			4.5			4.5	
Lane Util. Factor		1.00			1.00			0.95			0.95	
Frt		1.00			1.00			1.00			1.00	
Flt Protected		1.00			1.00			1.00			1.00	
Satd. Flow (prot)		1863			1863			3539			3539	
Flt Permitted		1.00			1.00			1.00			1.00	
Satd. Flow (perm)		1863			1863			3539			3539	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1	0	0	1	0	0	559	0	0	1460	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	1	0	0	559	0	0	1460	0
Turn Type		NA			NA			NA			NA	
Protected Phases		4			8			6			2	
Permitted Phases												
Actuated Green, G (s)		13.4			13.4			56.5			56.5	
Effective Green, g (s)		13.4			13.4			56.5			56.5	
Actuated g/C Ratio		0.17			0.17			0.72			0.72	
Clearance Time (s)		4.5			4.5			4.5			4.5	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		316			316			2534			2534	
v/s Ratio Prot		c0.00			0.00			0.16			c0.41	
v/s Ratio Perm												
v/c Ratio		0.00			0.00			0.22			0.58	
Uniform Delay, d1		27.2			27.2			3.8			5.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.0			0.0			0.2			1.0	
Delay (s)		27.2			27.2			4.0			6.4	
Level of Service		C			C			A			A	
Approach Delay (s)		27.2			27.2			4.0			6.4	
Approach LOS		C			C			A			A	

### Intersection Summary

HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	78.9	Sum of lost time (s)	9.0
Intersection Capacity Utilization	207.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	R	L	T	T	R	L	T	TR
Maximum Queue (m)	49.0	25.0	62.2	37.4	93.3	57.9	204.8	196.4	106.0	119.6	60.7	61.6
Average Queue (m)	23.1	13.0	29.2	13.5	24.1	51.4	117.3	110.7	50.0	67.3	29.2	33.8
95th Queue (m)	42.0	21.9	53.9	29.0	73.6	74.9	203.3	201.5	117.4	109.3	48.4	57.5
Link Distance (m)	235.7			487.5			280.3	280.3			906.1	906.1
Upstream Blk Time (%)							0					
Queuing Penalty (veh)							0					
Storage Bay Dist (m)		20.0	57.0		60.0	58.0			35.0	70.0		
Storage Blk Time (%)	21	1	1		3	10	27	39	5	12	0	
Queuing Penalty (veh)	32	1	7		7	43	99	102	23	21	1	

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	14.6	85.2	19.1	76.7	11.4	17.0	11.2	10.0
Average Queue (m)	5.4	29.8	5.5	32.8	2.9	7.4	2.3	3.7
95th Queue (m)	12.9	69.1	14.3	61.9	9.9	15.5	8.3	10.5
Link Distance (m)		487.5		233.9		652.1		216.0
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	23.0		75.0		28.0		30.0	
Storage Blk Time (%)		6		0				
Queuing Penalty (veh)		2		0				

**Intersection: 3: Old Ellwood Drive & Station Road**

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	31.6	36.6	16.2
Average Queue (m)	16.0	18.6	8.4
95th Queue (m)	24.6	28.3	14.6
Link Distance (m)	500.7	192.0	652.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Intersection: 4: Coleraine Drive & Old Ellwood Drive**

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (m)	187.1	23.6	24.2	71.6	96.0	97.8
Average Queue (m)	76.6	11.5	15.5	26.9	21.7	26.9
95th Queue (m)	195.8	19.9	22.2	51.0	67.1	71.1
Link Distance (m)	500.7	1.0	1.0		104.7	104.7
Upstream Blk Time (%)		35	36		1	1
Queuing Penalty (veh)		232	241		4	4
Storage Bay Dist (m)				20.0		
Storage Blk Time (%)				20	9	
Queuing Penalty (veh)				47	15	

**Intersection: 5: Coleraine Drive & Ellwood Drive West**

Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (m)	26.7	5.6	8.5	16.6	14.2	18.6
Average Queue (m)	7.8	0.2	0.3	4.4	0.5	0.8
95th Queue (m)	18.9	3.9	3.9	13.2	8.3	11.0
Link Distance (m)	268.5	104.7	104.7		280.3	280.3
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)				60.0		
Storage Blk Time (%)					0	
Queuing Penalty (veh)					0	

**Intersection: 6: Coleraine Drive**

Movement	EB	WB	SE	SE	NW	NW
Directions Served	T	T	T	T	T	T
Maximum Queue (m)	3.0	6.7	8.3	12.0	381.2	376.4
Average Queue (m)	0.7	0.6	0.9	1.2	198.0	200.4
95th Queue (m)	4.0	3.8	5.1	9.2	587.8	585.5
Link Distance (m)	209.0	124.5	1.0	1.0	711.8	711.8
Upstream Blk Time (%)			8	7	8	7
Queuing Penalty (veh)			19	19	0	0
Storage Bay Dist (m)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

**Network Summary**

Network wide Queuing Penalty: 919

Timings

2041 Grade Separation - Do Nothing

1: Coleraine Drive & Harvest Moon Drive/King Street West

Timing Plan: Weekday AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↕	↗	↖	↕	↗	↖	↕	↗	↖	↕
Traffic Volume (vph)	4	136	324	602	57	514	21	132	133	495	748
Future Volume (vph)	4	136	324	602	57	514	21	132	133	495	748
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		8		7	4		1	6		5	2
Permitted Phases	8		8	4		4	6		6	2	
Detector Phase	8	8	8	7	4	4	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	8.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0
Minimum Split (s)	41.1	41.1	41.1	8.0	41.1	41.1	8.0	37.6	37.6	8.0	37.6
Total Split (s)	41.1	41.1	41.1	35.0	76.1	76.1	8.0	37.9	37.9	26.0	55.9
Total Split (%)	29.4%	29.4%	29.4%	25.0%	54.4%	54.4%	5.7%	27.1%	27.1%	18.6%	39.9%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	3.1	3.1	3.1	0.0	3.1	3.1	0.0	2.6	2.6	0.0	2.6
Lost Time Adjust (s)		-3.1	-3.1	-2.0	-3.1	-3.1	-2.0	-2.6	-2.6	-2.0	-2.6
Total Lost Time (s)		4.0	4.0	1.0	4.0	4.0	1.0	4.0	4.0	1.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	None	Max	Max	None	None	None	None	Max

Intersection Summary

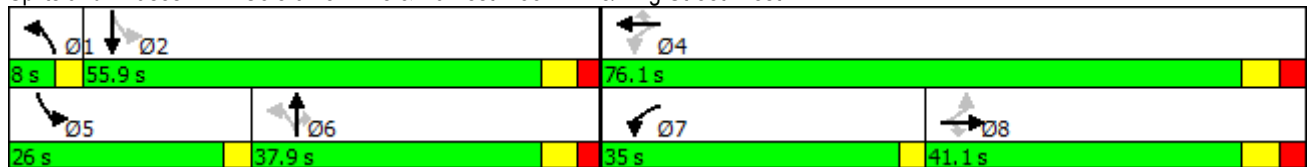
Cycle Length: 140

Actuated Cycle Length: 136.8

Natural Cycle: 125

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Coleraine Drive & Harvest Moon Drive/King Street West





HCM Signalized Intersection Capacity Analysis  
 1: Coleraine Drive & Harvest Moon Drive/King Street West

2041 Grade Separation - Do Nothing  
 Timing Plan: Weekday AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕
Traffic Volume (vph)	4	136	324	602	57	514	21	132	133	495	748	5
Future Volume (vph)	4	136	324	602	57	514	21	132	133	495	748	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7
Total Lost time (s)		4.0	4.0	1.0	4.0	4.0	1.0	4.0	4.0	1.0	4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1665	1568	1675	1812	1601	1691	2874	1526	1725	3228	
Flt Permitted		0.99	1.00	0.51	1.00	1.00	0.35	1.00	1.00	0.60	1.00	
Satd. Flow (perm)		1649	1568	907	1812	1601	620	2874	1526	1084	3228	
Peak-hour factor, PHF	0.50	0.83	0.95	0.88	0.58	0.83	0.83	0.79	0.85	0.84	0.98	0.63
Adj. Flow (vph)	8	164	341	684	98	619	25	167	156	589	763	8
RTOR Reduction (vph)	0	0	108	0	0	295	0	0	120	0	1	0
Lane Group Flow (vph)	0	172	233	684	98	324	25	167	36	589	770	0
Heavy Vehicles (%)	25%	8%	3%	3%	6%	2%	2%	27%	7%	0%	13%	4%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		
Actuated Green, G (s)		34.1	34.1	69.1	69.1	69.1	32.1	29.2	29.2	55.2	49.3	
Effective Green, g (s)		37.2	37.2	71.1	72.2	72.2	36.1	31.8	31.8	57.2	51.9	
Actuated g/C Ratio		0.27	0.27	0.52	0.52	0.52	0.26	0.23	0.23	0.41	0.38	
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		444	422	656	948	837	200	662	351	565	1214	
v/s Ratio Prot				c0.26	0.05		0.00	0.06		c0.19	0.24	
v/s Ratio Perm		0.10	0.15	0.28		0.20	0.03		0.02	0.24		
v/c Ratio		0.39	0.55	1.04	0.10	0.39	0.12	0.25	0.10	1.04	0.63	
Uniform Delay, d1		41.1	43.2	29.5	16.6	19.7	38.2	43.4	41.9	37.6	35.3	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.5	5.1	46.7	0.2	1.4	0.3	0.2	0.1	49.4	2.5	
Delay (s)		43.6	48.4	76.2	16.8	21.0	38.5	43.6	42.0	87.0	37.8	
Level of Service		D	D	E	B	C	D	D	D	F	D	
Approach Delay (s)		46.8			47.7			42.5			59.1	
Approach LOS		D			D			D			E	

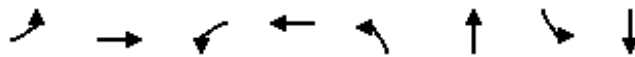
Intersection Summary

HCM 2000 Control Delay	51.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	138.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	88.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Timings  
2: Station Road & King Street West

2041 Grade Separation - Do Nothing  
Timing Plan: Weekday AM Peak

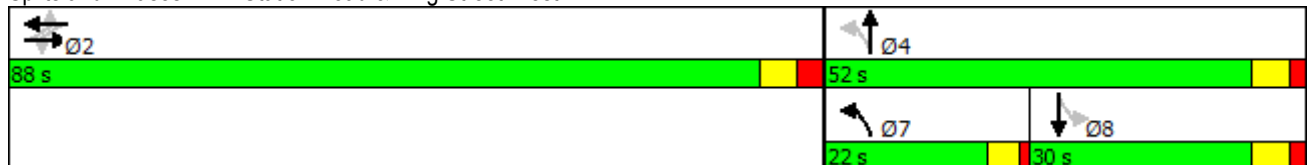


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↶	↷	↶	↷	↶	↷	↶	↷
Traffic Volume (vph)	2	499	9	937	194	5	18	9
Future Volume (vph)	2	499	9	937	194	5	18	9
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		2		2	7	4		8
Permitted Phases	2		2		4		8	
Detector Phase	2	2	2	2	7	4	8	8
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0
Minimum Split (s)	27.1	27.1	27.1	27.1	9.5	30.0	30.0	30.0
Total Split (s)	88.0	88.0	88.0	88.0	22.0	52.0	30.0	30.0
Total Split (%)	62.9%	62.9%	62.9%	62.9%	15.7%	37.1%	21.4%	21.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	3.1	3.1	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-3.0	-3.1	-3.0	-3.1	-3.0	-2.0	-3.0	-2.0
Total Lost Time (s)	4.1	4.0	4.1	4.0	1.5	4.0	3.0	4.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	Max	Max	Max	Max	None	None	None	None

Intersection Summary

Cycle Length: 140  
 Actuated Cycle Length: 131  
 Natural Cycle: 150  
 Control Type: Semi Act-Uncoord

Splits and Phases: 2: Station Road & King Street West



HCM Signalized Intersection Capacity Analysis  
2: Station Road & King Street West

2041 Grade Separation - Do Nothing  
Timing Plan: Weekday AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	499	263	9	937	3	194	5	25	18	9	42
Future Volume (vph)	2	499	263	9	937	3	194	5	25	18	9	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.0		4.1	4.0		1.5	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	1.00		1.00	0.90		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1723		1805	1843		1805	1706		1805	1628	
Flt Permitted	0.05	1.00		0.05	1.00		0.27	1.00		0.73	1.00	
Satd. Flow (perm)	90	1723		90	1843		516	1706		1380	1628	
Peak-hour factor, PHF	0.50	0.80	0.42	0.50	0.82	0.38	0.38	0.33	0.78	0.64	0.38	0.25
Adj. Flow (vph)	4	624	626	18	1143	8	511	15	32	28	24	168
RTOR Reduction (vph)	0	23	0	0	0	0	0	22	0	0	68	0
Lane Group Flow (vph)	4	1227	0	18	1151	0	511	25	0	28	124	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%	0%	0%	0%	0%	11%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		7	4			8	
Permitted Phases	2			2			4			8		
Actuated Green, G (s)	81.0	81.0		81.0	81.0		36.9	36.9		14.9	14.9	
Effective Green, g (s)	84.0	84.1		84.0	84.1		39.9	38.9		17.9	16.9	
Actuated g/C Ratio	0.64	0.64		0.64	0.64		0.30	0.30		0.14	0.13	
Clearance Time (s)	7.1	7.1		7.1	7.1		4.5	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	57	1106		57	1183		358	506		188	210	
v/s Ratio Prot		c0.71			0.62		c0.22	0.01			c0.08	
v/s Ratio Perm	0.04			0.20			0.21			0.02		
v/c Ratio	0.07	1.11		0.32	0.97		1.43	0.05		0.15	0.59	
Uniform Delay, d1	8.8	23.5		10.6	22.4		41.2	32.8		49.8	53.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.4	62.3		13.9	20.4		207.9	0.0		0.4	4.4	
Delay (s)	11.2	85.8		24.5	42.8		249.1	32.9		50.2	58.2	
Level of Service	B	F		C	D		F	C		D	E	
Approach Delay (s)		85.5			42.5			230.9			57.2	
Approach LOS		F			D			F			E	

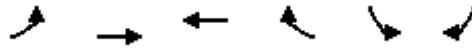
Intersection Summary

HCM 2000 Control Delay	93.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	131.0	Sum of lost time (s)	9.5
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 3: Old Ellwood Drive & Station Road

2041 Grade Separation - Do Nothing  
 Timing Plan: Weekday AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	0	0	2	138	213	0
Future Volume (vph)	0	0	2	138	213	0
Peak Hour Factor	0.25	0.84	0.77	0.39	0.72	0.71
Hourly flow rate (vph)	0	0	3	354	296	0

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	0	357	296
Volume Left (vph)	0	0	296
Volume Right (vph)	0	354	0
Hadj (s)	0.00	-0.59	0.27
Departure Headway (s)	5.1	4.1	5.0
Degree Utilization, x	0.00	0.41	0.41
Capacity (veh/h)	652	832	693
Control Delay (s)	8.1	9.8	11.3
Approach Delay (s)	0.0	9.8	11.3
Approach LOS	A	A	B

Intersection Summary			
Delay		10.5	
Level of Service		B	
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	R	L	T	T	R	L	T	TR
Maximum Queue (m)	76.7	74.0	156.9	456.5	16.2	17.9	46.5	46.1	36.2	170.0	432.8	418.7
Average Queue (m)	30.9	37.7	148.5	311.3	0.9	6.1	22.2	19.1	16.8	167.7	305.8	276.8
95th Queue (m)	60.0	68.6	180.6	639.6	11.0	16.3	39.8	37.1	29.4	183.1	510.5	504.4
Link Distance (m)	235.9			487.9			1563.6	1563.6			906.1	906.1
Upstream Blk Time (%)				3								
Queuing Penalty (veh)				36								
Storage Bay Dist (m)		20.0	57.0		60.0	58.0			35.0	70.0		
Storage Blk Time (%)	27	34	67				0	2	0	81	6	
Queuing Penalty (veh)	87	47	385				0	3	0	302	28	

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	22.7	141.6	107.7	573.7	89.1	63.6	15.2	28.0
Average Queue (m)	0.9	63.1	6.7	293.9	44.8	10.4	4.8	11.5
95th Queue (m)	15.2	122.4	48.9	701.7	79.1	51.9	12.9	24.2
Link Distance (m)		487.9		811.0		652.5		216.0
Upstream Blk Time (%)				3				
Queuing Penalty (veh)				0				
Storage Bay Dist (m)	23.0		75.0		28.0		30.0	
Storage Blk Time (%)		19		36	40			0
Queuing Penalty (veh)		0		3	12			0

**Intersection: 3: Old Ellwood Drive & Station Road**

Movement	WB	SB
Directions Served	TR	LR
Maximum Queue (m)	16.5	24.8
Average Queue (m)	9.6	14.6
95th Queue (m)	13.3	21.7
Link Distance (m)	192.0	652.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Network Summary**

Network wide Queuing Penalty: 904

Timings  
1: Coleraine Drive & Harvest Moon Drive/King Street West

2041 Grade Separation  
Timing Plan: Weekday PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↕	↗	↖	↕	↗	↖	↕	↗	↖	↕
Traffic Volume (vph)	6	121	132	184	210	738	247	672	344	526	174
Future Volume (vph)	6	121	132	184	210	738	247	672	344	526	174
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		8		7	4		1	6		5	2
Permitted Phases	8		8	4		4	6		6	2	
Detector Phase	8	8	8	7	4	4	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	8.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0
Minimum Split (s)	32.1	32.1	32.1	8.0	32.1	32.1	8.0	34.6	34.6	8.0	34.6
Total Split (s)	41.2	41.2	41.2	12.0	53.2	53.2	15.0	37.8	37.8	49.0	71.8
Total Split (%)	29.4%	29.4%	29.4%	8.6%	38.0%	38.0%	10.7%	27.0%	27.0%	35.0%	51.3%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	3.1	3.1	3.1	0.0	3.1	3.1	0.0	2.6	2.6	0.0	2.6
Lost Time Adjust (s)		-3.1	-3.1	-3.0	-3.1	-3.1	-3.0	-2.6	-2.6	-3.0	-2.6
Total Lost Time (s)		4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	None	Max	Max	None	None	None	None	Max

Intersection Summary

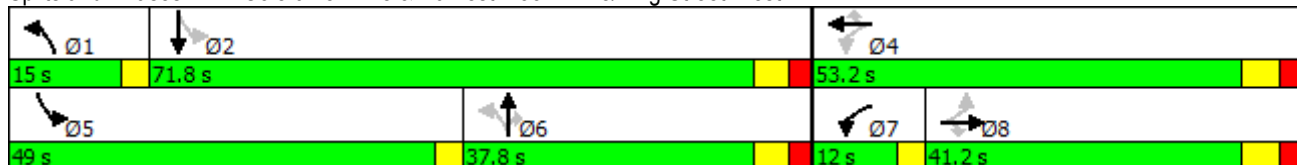
Cycle Length: 140

Actuated Cycle Length: 139.7

Natural Cycle: 105

Control Type: Semi Act-Uncoord

Splits and Phases: 1: Coleraine Drive & Harvest Moon Drive/King Street West



# HCM Signalized Intersection Capacity Analysis

## 1: Coleraine Drive & Harvest Moon Drive/King Street West

2041 Grade Separation  
Timing Plan: Weekday PM Peak



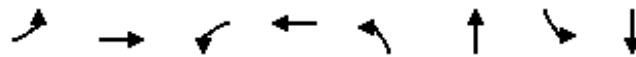
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↖	↖	↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	6	121	132	184	210	738	247	672	344	526	174	9
Future Volume (vph)	6	121	132	184	210	738	247	672	344	526	174	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7
Total Lost time (s)		4.0	4.0	0.0	4.0	4.0	0.0	4.0	4.0	0.0	4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1807	1615	1725	1921	1592	1725	3411	1580	1708	2982	
Flt Permitted		0.95	1.00	0.54	1.00	1.00	0.61	1.00	1.00	0.12	1.00	
Satd. Flow (perm)		1733	1615	976	1921	1592	1114	3411	1580	212	2982	
Peak-hour factor, PHF	0.38	0.80	0.80	0.86	0.78	0.84	0.95	0.91	0.76	0.80	0.90	0.32
Adj. Flow (vph)	16	151	165	214	269	879	260	738	453	658	193	28
RTOR Reduction (vph)	0	0	89	0	0	414	0	0	162	0	8	0
Lane Group Flow (vph)	0	167	76	214	269	465	260	738	291	658	213	0
Confl. Peds. (#/hr)	2					2			1	1		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	7%	1%	1%	23%	0%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4	6		6	2		
Actuated Green, G (s)		34.1	34.1	46.1	46.1	46.1	42.4	30.9	30.9	79.9	65.4	
Effective Green, g (s)		37.2	37.2	49.1	49.2	49.2	48.4	33.5	33.5	82.9	68.0	
Actuated g/C Ratio		0.27	0.27	0.35	0.35	0.35	0.35	0.24	0.24	0.59	0.49	
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		461	430	407	676	560	449	817	378	650	1451	
v/s Ratio Prot				0.05	0.14		0.06	c0.22		c0.35	0.07	
v/s Ratio Perm		0.10	0.05	0.14		c0.29	0.14		0.18	0.25		
v/c Ratio		0.36	0.18	0.53	0.40	0.83	0.58	0.90	0.77	1.01	0.15	
Uniform Delay, d1		41.6	39.5	34.1	34.1	41.4	35.2	51.5	49.5	38.6	19.8	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.2	0.9	1.2	1.7	13.4	1.8	13.3	9.3	38.4	0.2	
Delay (s)		43.8	40.4	35.3	35.8	54.8	37.0	64.8	58.8	76.9	20.0	
Level of Service		D	D	D	D	D	D	E	E	E	C	
Approach Delay (s)		42.1			48.0			57.9			62.6	
Approach LOS		D			D			E			E	

### Intersection Summary

HCM 2000 Control Delay	54.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	139.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Timings  
2: Station Road & King Street West

2041 Grade Separation  
Timing Plan: Weekday PM Peak



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↶	↷	↶	↷	↶	↷	↶	↷
Traffic Volume (vph)	32	697	29	762	356	15	9	5
Future Volume (vph)	32	697	29	762	356	15	9	5
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		2		2	7	4		8
Permitted Phases	2		2		4		8	
Detector Phase	2	2	2	2	7	4	8	8
Switch Phase								
Minimum Initial (s)	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0
Minimum Split (s)	26.1	26.1	26.1	26.1	9.5	28.0	28.0	28.0
Total Split (s)	88.6	88.6	88.6	88.6	33.4	61.4	28.0	28.0
Total Split (%)	59.1%	59.1%	59.1%	59.1%	22.3%	40.9%	18.7%	18.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.5	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	3.1	3.1	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-3.0	-3.1	-3.0	-3.1	-3.0	-2.0	-3.0	-2.0
Total Lost Time (s)	4.1	4.0	4.1	4.0	1.5	4.0	3.0	4.0
Lead/Lag					Lead		Lag	Lag
Lead-Lag Optimize?					Yes		Yes	Yes
Recall Mode	Max	Max	Max	Max	None	None	None	None

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 133.5

Natural Cycle: 150

Control Type: Semi Act-Uncoord

Splits and Phases: 2: Station Road & King Street West





# HCM Signalized Intersection Capacity Analysis

## 2: Station Road & King Street West

2041 Grade Separation  
Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	697	263	29	762	19	356	15	28	9	5	14
Future Volume (vph)	32	697	263	29	762	19	356	15	28	9	5	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.1	4.0		4.1	4.0		1.5	4.0		3.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	0.99		1.00	0.90		1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1740		1805	1798		1805	1710		1805	1710	
Flt Permitted	0.18	1.00		0.05	1.00		0.63	1.00		0.72	1.00	
Satd. Flow (perm)	340	1740		90	1798		1206	1710		1364	1710	
Peak-hour factor, PHF	0.89	0.94	0.75	0.56	0.93	0.59	0.55	0.75	0.70	0.56	0.42	0.58
Adj. Flow (vph)	36	741	351	52	819	32	647	20	40	16	12	24
RTOR Reduction (vph)	0	10	0	0	1	0	0	28	0	0	22	0
Lane Group Flow (vph)	36	1082	0	52	850	0	647	32	0	16	14	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	0%	2%	8%	0%	5%	5%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		7	4			8	
Permitted Phases	2			2			4			8		
Actuated Green, G (s)	81.7	81.7		81.7	81.7		40.1	40.1		6.6	6.6	
Effective Green, g (s)	84.7	84.8		84.7	84.8		43.1	42.1		9.6	8.6	
Actuated g/C Ratio	0.63	0.63		0.63	0.63		0.32	0.31		0.07	0.06	
Clearance Time (s)	7.1	7.1		7.1	7.1		4.5	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	213	1093		56	1130		527	533		97	109	
v/s Ratio Prot		c0.62			0.47		c0.29	0.02			0.01	
v/s Ratio Perm	0.11			0.58			0.10			0.01		
v/c Ratio	0.17	0.99		0.93	0.75		1.23	0.06		0.16	0.12	
Uniform Delay, d1	10.4	24.6		22.4	17.7		44.5	32.5		58.9	59.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	25.0		100.9	4.6		118.4	0.0		0.8	0.5	
Delay (s)	12.2	49.6		123.3	22.3		162.9	32.6		59.7	60.1	
Level of Service	B	D		F	C		F	C		E	E	
Approach Delay (s)		48.4			28.1			151.9			60.0	
Approach LOS		D			C			F			E	

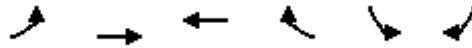
### Intersection Summary

HCM 2000 Control Delay	68.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	134.9	Sum of lost time (s)	9.5
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 3: Old Ellwood Drive & Station Road

2041 Grade Separation  
 Timing Plan: Weekday PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↗		↙	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	0	9	31	461	154	0
Future Volume (vph)	0	9	31	461	154	0
Peak Hour Factor	0.63	0.76	0.86	0.94	0.78	0.42
Hourly flow rate (vph)	0	12	36	490	197	0

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	12	526	197
Volume Left (vph)	0	0	197
Volume Right (vph)	0	490	0
Hadj (s)	0.00	-0.56	0.20
Departure Headway (s)	5.0	3.9	5.2
Degree Utilization, x	0.02	0.57	0.29
Capacity (veh/h)	660	889	640
Control Delay (s)	8.1	12.0	10.3
Approach Delay (s)	8.1	12.0	10.3
Approach LOS	A	B	B

Intersection Summary			
Delay		11.5	
Level of Service		B	
Intersection Capacity Utilization	45.3%	ICU Level of Service	A
Analysis Period (min)	15		

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	L	T	R	L	T	T	R	L	T	TR
Maximum Queue (m)	53.8	23.8	58.0	82.8	98.0	57.9	187.0	194.6	106.0	168.7	207.1	108.4
Average Queue (m)	25.7	11.0	31.3	37.8	39.2	50.7	98.3	99.1	63.7	110.1	30.0	23.4
95th Queue (m)	45.6	18.4	51.1	68.2	96.1	70.7	163.1	169.3	118.3	169.2	125.5	70.6
Link Distance (m)	235.9			487.8			1024.8	1024.8			906.1	906.1
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)		20.0	57.0		60.0	58.0			35.0	70.0		
Storage Blk Time (%)	25	0	1	1	5	4	30	52	22	32		
Queuing Penalty (veh)	33	1	8	10	20	13	74	180	73	28		

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	105.7	307.0	60.6	143.1	92.4	112.6	12.4	16.2
Average Queue (m)	11.6	141.0	15.3	76.4	64.7	20.9	2.1	4.7
95th Queue (m)	51.7	267.6	43.1	131.5	93.4	74.0	8.0	12.5
Link Distance (m)		487.8		233.9		652.5		216.0
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	23.0		75.0		28.0		30.0	
Storage Blk Time (%)	0	30	1	8	47	0		
Queuing Penalty (veh)	1	10	6	2	20	1		

**Intersection: 3: Old Ellwood Drive & Station Road**

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	9.2	31.5	20.2
Average Queue (m)	1.8	18.5	11.6
95th Queue (m)	7.8	26.2	17.6
Link Distance (m)	256.1	192.0	652.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

**Network Summary**

Network wide Queuing Penalty: 481

Timings

2041 Grade Separation + Improvements

1: Coleraine Drive & Harvest Moon Drive/King Street West

Timing Plan: Weekday AM Peak

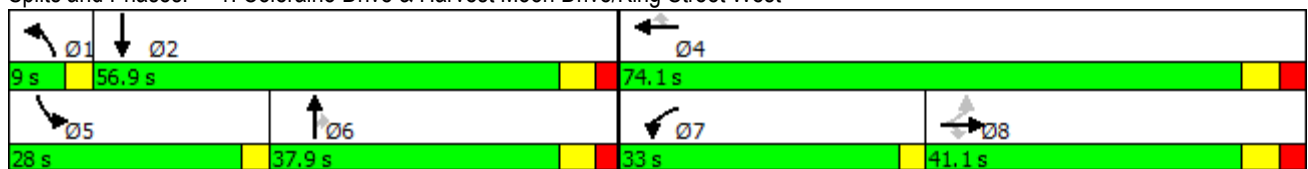


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↗	↘	↖↗	↖	↗	↖	↖↗	↗	↖↗	↖↗
Traffic Volume (vph)	4	136	324	602	57	514	21	132	133	495	748
Future Volume (vph)	4	136	324	602	57	514	21	132	133	495	748
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases		8		7	4		1	6		5	2
Permitted Phases	8		8			4			6		
Detector Phase	8	8	8	7	4	4	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	8.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0
Minimum Split (s)	41.1	41.1	41.1	8.0	41.1	41.1	8.0	37.6	37.6	8.0	37.6
Total Split (s)	41.1	41.1	41.1	33.0	74.1	74.1	9.0	37.9	37.9	28.0	56.9
Total Split (%)	29.4%	29.4%	29.4%	23.6%	52.9%	52.9%	6.4%	27.1%	27.1%	20.0%	40.6%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	3.1	3.1	3.1	0.0	3.1	3.1	0.0	2.6	2.6	0.0	2.6
Lost Time Adjust (s)		-3.1	-3.1	-2.0	-3.1	-3.1	-2.0	-2.6	-2.6	-2.0	-2.6
Total Lost Time (s)		4.0	4.0	1.0	4.0	4.0	1.0	4.0	4.0	1.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	Max	None	None	None	None	Max
Act Effct Green (s)		37.7	37.7	31.5	70.2	70.2	7.7	30.7	30.7	26.5	53.0
Actuated g/C Ratio		0.28	0.28	0.23	0.51	0.51	0.06	0.23	0.23	0.19	0.39
v/c Ratio		0.38	0.65	0.91	0.11	0.55	0.26	0.26	0.34	0.91	0.62
Control Delay		43.9	34.0	68.8	18.2	3.4	70.1	44.5	8.2	72.5	36.6
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		43.9	34.0	68.8	18.2	3.4	70.1	44.5	8.2	72.5	36.6
LOS		D	C	E	B	A	E	D	A	E	D
Approach Delay		37.3			36.4			30.1			52.1
Approach LOS		D			D			C			D

Intersection Summary

Cycle Length: 140  
 Actuated Cycle Length: 136.4  
 Natural Cycle: 125  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.91  
 Intersection Signal Delay: 41.8  
 Intersection LOS: D  
 Intersection Capacity Utilization 68.1%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 1: Coleraine Drive & Harvest Moon Drive/King Street West



# HCM Signalized Intersection Capacity Analysis 2041 Grade Separation + Improvements

## 1: Coleraine Drive & Harvest Moon Drive/King Street West

Timing Plan: Weekday AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘	↖↗	↖	↗	↖	↖↗	↗	↖↗	↖↗	↖↗
Traffic Volume (vph)	4	136	324	602	57	514	21	132	133	495	748	5
Future Volume (vph)	4	136	324	602	57	514	21	132	133	495	748	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7
Total Lost time (s)		4.0	4.0	1.0	4.0	4.0	1.0	4.0	4.0	1.0	4.0	
Lane Util. Factor		1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1665	1568	3249	1812	1601	1691	2874	1526	3346	3228	
Flt Permitted		0.99	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1649	1568	3249	1812	1601	1691	2874	1526	3346	3228	
Peak-hour factor, PHF	0.50	0.83	0.95	0.88	0.58	0.83	0.83	0.79	0.85	0.84	0.98	0.63
Adj. Flow (vph)	8	164	341	684	98	619	25	167	156	589	763	8
RTOR Reduction (vph)	0	0	92	0	0	303	0	0	120	0	1	0
Lane Group Flow (vph)	0	172	249	684	98	316	25	167	36	589	770	0
Heavy Vehicles (%)	25%	8%	3%	3%	6%	2%	2%	27%	7%	0%	13%	4%
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8		8			4			6			
Actuated Green, G (s)		34.6	34.6	29.5	67.1	67.1	3.5	29.4	29.4	24.5	50.4	
Effective Green, g (s)		37.7	37.7	31.5	70.2	70.2	5.5	32.0	32.0	26.5	53.0	
Actuated g/C Ratio		0.27	0.27	0.23	0.51	0.51	0.04	0.23	0.23	0.19	0.38	
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		451	429	743	923	816	67	667	354	643	1242	
v/s Ratio Prot				c0.21	0.05		0.01	0.06		c0.18	c0.24	
v/s Ratio Perm		0.10	c0.16			0.20			0.02			
v/c Ratio		0.38	0.58	0.92	0.11	0.39	0.37	0.25	0.10	0.92	0.62	
Uniform Delay, d1		40.5	43.2	51.9	17.5	20.6	64.4	43.1	41.6	54.5	34.2	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5	1.9	16.7	0.2	1.4	3.5	0.2	0.1	17.8	2.3	
Delay (s)		41.1	45.1	68.6	17.7	22.0	67.9	43.3	41.7	72.3	36.6	
Level of Service		D	D	E	B	C	E	D	D	E	D	
Approach Delay (s)		43.7			44.4			44.3			52.0	
Approach LOS		D			D			D			D	

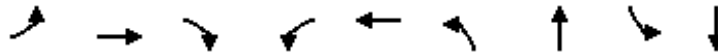
### Intersection Summary

HCM 2000 Control Delay	47.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	137.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Timings  
2: Station Road & King Street West

2041 Grade Separation + Improvements  
Timing Plan: Weekday AM Peak

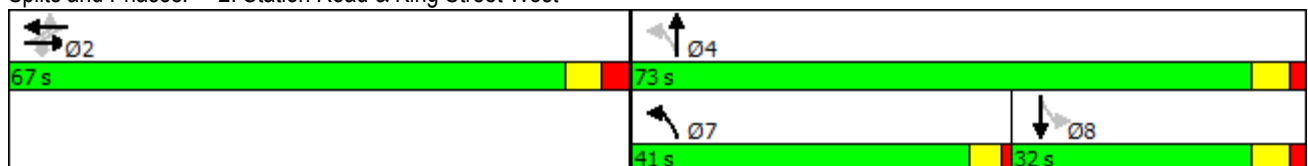


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	2	499	263	9	937	194	5	18	9
Future Volume (vph)	2	499	263	9	937	194	5	18	9
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		2			2	7	4		8
Permitted Phases	2		2	2		4		8	
Detector Phase	2	2	2	2	2	7	4	8	8
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0
Minimum Split (s)	27.1	27.1	27.1	27.1	27.1	9.5	32.0	32.0	32.0
Total Split (s)	67.0	67.0	67.0	67.0	67.0	41.0	73.0	32.0	32.0
Total Split (%)	47.9%	47.9%	47.9%	47.9%	47.9%	29.3%	52.1%	22.9%	22.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.5	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	3.1	3.1	3.1	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-3.1	-3.1	-3.1	-3.0	-3.1	-3.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.1	4.0	1.5	4.0	4.0	4.0
Lead/Lag						Lead		Lag	Lag
Lead-Lag Optimize?						Yes		Yes	Yes
Recall Mode	Max	Max	Max	Max	Max	None	None	None	None
Act Effct Green (s)	63.2	63.2	63.2	63.1	63.2	57.4	54.9	15.7	15.7
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.50	0.46	0.44	0.12	0.12
v/c Ratio	0.03	0.68	0.59	0.08	0.66	0.83	0.06	0.16	0.70
Control Delay	20.0	30.0	6.7	20.4	26.7	40.3	9.3	51.3	44.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	30.0	6.7	20.4	26.7	40.3	9.3	51.3	44.4
LOS	B	C	A	C	C	D	A	D	D
Approach Delay		18.3			26.6		37.6		45.3
Approach LOS		B			C		D		D

Intersection Summary

Cycle Length: 140  
 Actuated Cycle Length: 126.1  
 Natural Cycle: 80  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 26.6  
 Intersection LOS: C  
 Intersection Capacity Utilization 50.3%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 2: Station Road & King Street West



HCM Signalized Intersection Capacity Analysis  
2: Station Road & King Street West

2041 Grade Separation + Improvements  
Timing Plan: Weekday AM Peak



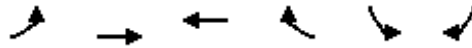
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	499	263	9	937	3	194	5	25	18	9	42
Future Volume (vph)	2	499	263	9	937	3	194	5	25	18	9	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.1	4.0		1.5	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.90		1.00	0.87	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1827	1615	1805	3501		1805	1706		1805	1628	
Flt Permitted	0.14	1.00	1.00	0.23	1.00		0.27	1.00		0.73	1.00	
Satd. Flow (perm)	262	1827	1615	435	3501		504	1706		1380	1628	
Peak-hour factor, PHF	0.50	0.80	0.42	0.50	0.82	0.38	0.38	0.33	0.78	0.64	0.38	0.25
Adj. Flow (vph)	4	624	626	18	1143	8	511	15	32	28	24	168
RTOR Reduction (vph)	0	0	257	0	0	0	0	18	0	0	71	0
Lane Group Flow (vph)	4	624	369	18	1151	0	511	29	0	28	121	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	0%	4%	0%	0%	3%	0%	0%	0%	0%	0%	11%	0%
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		7	4			8	
Permitted Phases	2		2	2			4			8		
Actuated Green, G (s)	60.1	60.1	60.1	60.1	60.1		52.9	52.9		13.8	13.8	
Effective Green, g (s)	63.2	63.2	63.2	63.1	63.2		55.9	54.9		15.8	15.8	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.50		0.44	0.44		0.13	0.13	
Clearance Time (s)	7.1	7.1	7.1	7.1	7.1		4.5	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	131	915	809	217	1754		611	742		172	203	
v/s Ratio Prot		c0.34			0.33		c0.25	0.02			c0.07	
v/s Ratio Perm	0.02		0.23	0.04			0.12			0.02		
v/c Ratio	0.03	0.68	0.46	0.08	0.66		0.84	0.04		0.16	0.60	
Uniform Delay, d1	15.9	23.8	20.3	16.4	23.4		28.2	20.4		49.2	52.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	4.1	1.8	0.7	1.9		9.7	0.0		0.4	4.7	
Delay (s)	16.4	27.9	22.2	17.2	25.3		37.9	20.5		49.7	56.8	
Level of Service	B	C	C	B	C		D	C		D	E	
Approach Delay (s)		25.0			25.2			36.4			55.9	
Approach LOS		C			C			D			E	

Intersection Summary		
HCM 2000 Control Delay	29.2	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio	0.71	
Actuated Cycle Length (s)	126.1	Sum of lost time (s) 9.5
Intersection Capacity Utilization	50.3%	ICU Level of Service A
Analysis Period (min)	15	

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2041 Grade Separation + Improvements  
 3: Old Ellwood Drive & Station Road

Timing Plan: Weekday AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	0	32	2	138	213	0
Future Volume (vph)	0	32	2	138	213	0
Peak Hour Factor	0.25	0.84	0.77	0.39	0.72	0.71
Hourly flow rate (vph)	0	38	3	354	296	0

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	38	357	296
Volume Left (vph)	0	0	296
Volume Right (vph)	0	354	0
Hadj (s)	0.03	-0.59	0.27
Departure Headway (s)	5.2	4.2	5.0
Degree Utilization, x	0.05	0.41	0.41
Capacity (veh/h)	637	818	679
Control Delay (s)	8.5	10.1	11.6
Approach Delay (s)	8.5	10.1	11.6
Approach LOS	A	B	B

Intersection Summary			
Delay		10.6	
Level of Service		B	
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		



**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	LT	R	L	L	T	R	L	T	T	R	L	L
Maximum Queue (m)	90.0	87.5	96.7	115.5	53.2	42.1	26.4	48.6	43.8	35.8	95.4	92.3
Average Queue (m)	36.6	47.4	59.6	64.1	4.6	4.7	11.3	20.5	17.6	14.6	57.2	54.8
95th Queue (m)	72.7	80.6	86.1	95.8	30.3	22.0	23.9	38.9	36.2	27.5	85.4	84.0
Link Distance (m)	234.3				480.3		480.3		1555.3		1555.3	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	20.0		57.0		57.0		58.0		35.0		70.0	
Storage Blk Time (%)	28	44	10	14					2	0	6	4
Queuing Penalty (veh)	90	62	6	8					3	0	21	16

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	112.0	118.7
Average Queue (m)	66.0	70.8
95th Queue (m)	97.2	104.7
Link Distance (m)	904.7	904.7
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)	6	
Queuing Penalty (veh)	30	

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB		
Directions Served	L	T	R	L	T	TR	L	TR	L	TR		
Maximum Queue (m)	7.0	121.4	55.5	11.2	83.0	76.1	59.8	16.8	20.8	23.8		
Average Queue (m)	0.3	43.4	17.0	2.3	42.2	33.9	29.5	3.2	5.4	9.4		
95th Queue (m)	2.6	94.8	40.3	8.8	72.3	63.5	51.7	10.9	14.9	19.0		
Link Distance (m)	480.3		480.3		159.3		159.3		647.5		211.1	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	23.0		75.0		28.0		30.0					
Storage Blk Time (%)	12		0		14		0		0			
Queuing Penalty (veh)	0		0		4		0		0			

Intersection: 3: Old Ellwood Drive & Station Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	10.4	16.7	29.1
Average Queue (m)	5.7	10.2	16.3
95th Queue (m)	13.0	14.4	24.2
Link Distance (m)	256.1	192.0	647.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 241

Timings

2041 Grade Separation + Improvements

1: Coleraine Drive & Harvest Moon Drive/King Street West

Timing Plan: Weekday PM Peak

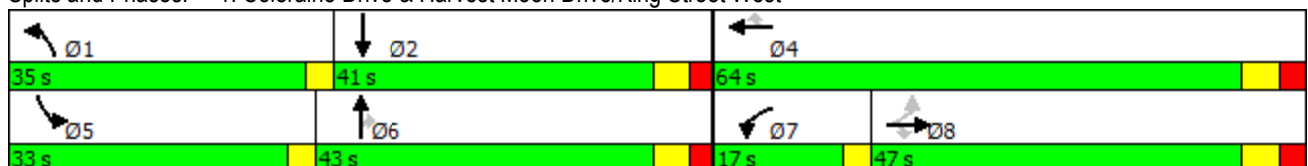


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		↗	↘	↖↗	↖	↗	↖	↗↗	↗	↖↗	↖↗
Traffic Volume (vph)	6	121	132	184	210	738	247	672	344	526	174
Future Volume (vph)	6	121	132	184	210	738	247	672	344	526	174
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases		8		7	4		1	6		5	2
Permitted Phases	8		8			4			6		
Detector Phase	8	8	8	7	4	4	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	8.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0	8.0	5.0	8.0
Minimum Split (s)	35.1	35.1	35.1	8.0	35.1	35.1	8.0	34.6	34.6	8.0	34.6
Total Split (s)	47.0	47.0	47.0	17.0	64.0	64.0	35.0	43.0	43.0	33.0	41.0
Total Split (%)	33.6%	33.6%	33.6%	12.1%	45.7%	45.7%	25.0%	30.7%	30.7%	23.6%	29.3%
Yellow Time (s)	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	3.1	3.1	3.1	0.0	3.1	3.1	0.0	2.6	2.6	0.0	2.6
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6
Lead/Lag	Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Recall Mode	Max	Max	Max	None	Max	Max	None	None	None	None	Max
Act Effct Green (s)		41.1	41.1	12.9	57.0	57.0	24.6	33.9	33.9	28.9	38.2
Actuated g/C Ratio		0.30	0.30	0.09	0.42	0.42	0.18	0.25	0.25	0.21	0.28
v/c Ratio		0.32	0.29	0.68	0.34	0.91	0.84	0.87	0.81	0.94	0.26
Control Delay		40.5	12.8	71.6	29.2	29.5	76.8	61.6	36.9	74.9	38.3
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		40.5	12.8	71.6	29.2	29.5	76.8	61.6	36.9	74.9	38.3
LOS		D	B	E	C	C	E	E	D	E	D
Approach Delay		26.7			36.1			56.6			65.7
Approach LOS		C			D			E			E

Intersection Summary

Cycle Length: 140  
 Actuated Cycle Length: 136.5  
 Natural Cycle: 100  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.94  
 Intersection Signal Delay: 49.2  
 Intersection LOS: D  
 Intersection Capacity Utilization 88.7%  
 ICU Level of Service E  
 Analysis Period (min) 15

Splits and Phases: 1: Coleraine Drive & Harvest Moon Drive/King Street West



HCM Signalized Intersection Capacity Analysis    2041 Grade Separation + Improvements  
 1: Coleraine Drive & Harvest Moon Drive/King Street West    Timing Plan: Weekday PM Peak



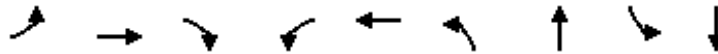
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘	↖↗	↖	↗	↖	↖↗	↗	↖↗	↖↗	↖↗
Traffic Volume (vph)	6	121	132	184	210	738	247	672	344	526	174	9
Future Volume (vph)	6	121	132	184	210	738	247	672	344	526	174	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.0	3.2	3.6	3.2	3.7	3.7	3.2	3.7	3.7	3.2	3.7	3.7
Total Lost time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Lane Util. Factor		1.00	1.00	0.97	1.00	1.00	1.00	0.95	1.00	0.97	0.95	
Frbp, ped/bikes		1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1807	1615	3346	1921	1593	1725	3411	1595	3313	2982	
Flt Permitted		0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1730	1615	3346	1921	1593	1725	3411	1595	3313	2982	
Peak-hour factor, PHF	0.38	0.80	0.80	0.86	0.78	0.84	0.95	0.91	0.76	0.80	0.90	0.32
Adj. Flow (vph)	16	151	165	214	269	879	260	738	453	658	193	28
RTOR Reduction (vph)	0	0	87	0	0	303	0	0	164	0	8	0
Lane Group Flow (vph)	0	167	78	214	269	576	260	738	289	658	213	0
Confl. Peds. (#/hr)	2					2			1	1		
Heavy Vehicles (%)	0%	0%	0%	0%	0%	1%	0%	7%	1%	1%	23%	0%
Turn Type	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases		8		7	4		1	6		5	2	
Permitted Phases	8		8			4			6			
Actuated Green, G (s)		41.1	41.1	12.9	57.0	57.0	24.6	33.9	33.9	28.9	38.2	
Effective Green, g (s)		41.1	41.1	12.9	57.0	57.0	24.6	33.9	33.9	28.9	38.2	
Actuated g/C Ratio		0.30	0.30	0.09	0.42	0.42	0.18	0.25	0.25	0.21	0.28	
Clearance Time (s)		7.1	7.1	3.0	7.1	7.1	3.0	6.6	6.6	3.0	6.6	
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		520	486	316	802	665	310	847	396	701	834	
v/s Ratio Prot				0.06	0.14		0.15	c0.22		c0.20	0.07	
v/s Ratio Perm		0.10	0.05			c0.36			0.18			
v/c Ratio		0.32	0.16	0.68	0.34	0.87	0.84	0.87	0.73	0.94	0.26	
Uniform Delay, d1		36.9	35.0	59.8	26.9	36.3	54.0	49.2	47.1	52.9	38.1	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.6	0.7	5.7	1.1	14.2	17.7	9.8	6.8	20.2	0.7	
Delay (s)		38.5	35.7	65.4	28.1	50.5	71.7	59.0	53.9	73.1	38.9	
Level of Service		D	D	E	C	D	E	E	D	E	D	
Approach Delay (s)		37.2			48.4			59.7			64.5	
Approach LOS		D			D			E			E	

**Intersection Summary**

HCM 2000 Control Delay	55.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	136.5	Sum of lost time (s)	19.7
Intersection Capacity Utilization	88.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Timings  
2: Station Road & King Street West

2041 Grade Separation + Improvements  
Timing Plan: Weekday PM Peak

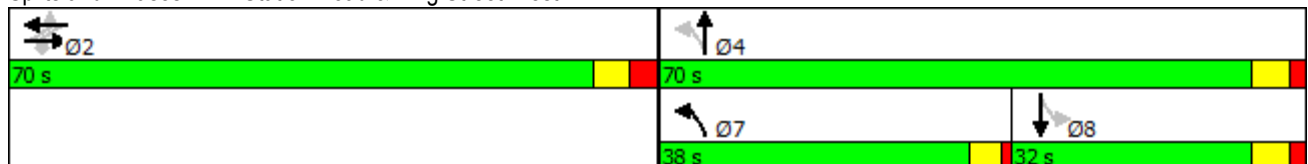


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	32	697	263	29	762	356	15	9	5
Future Volume (vph)	32	697	263	29	762	356	15	9	5
Turn Type	Perm	NA	Perm	Perm	NA	pm+pt	NA	Perm	NA
Protected Phases		2			2	7	4		8
Permitted Phases	2		2	2		4		8	
Detector Phase	2	2	2	2	2	7	4	8	8
Switch Phase									
Minimum Initial (s)	8.0	8.0	8.0	8.0	8.0	5.0	8.0	8.0	8.0
Minimum Split (s)	27.1	27.1	27.1	27.1	27.1	9.5	32.0	32.0	32.0
Total Split (s)	70.0	70.0	70.0	70.0	70.0	38.0	70.0	32.0	32.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	27.1%	50.0%	22.9%	22.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.5	4.0	4.0	4.0
All-Red Time (s)	3.1	3.1	3.1	3.1	3.1	1.0	2.0	2.0	2.0
Lost Time Adjust (s)	-3.1	-3.1	-3.1	-3.0	-3.1	-3.0	-2.0	-2.0	-2.0
Total Lost Time (s)	4.0	4.0	4.0	4.1	4.0	1.5	4.0	4.0	4.0
Lead/Lag						Lead		Lag	Lag
Lead-Lag Optimize?						Yes		Yes	Yes
Recall Mode	Max	Max	Max	Max	Max	None	None	None	None
Act Effct Green (s)	66.1	66.1	66.1	66.0	66.1	47.7	45.2	10.3	10.3
Actuated g/C Ratio	0.55	0.55	0.55	0.55	0.55	0.40	0.38	0.09	0.09
v/c Ratio	0.13	0.72	0.37	0.27	0.45	0.97	0.09	0.14	0.21
Control Delay	15.7	25.6	5.6	20.1	17.3	63.0	10.8	54.8	29.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.7	25.6	5.6	20.1	17.3	63.0	10.8	54.8	29.6
LOS	B	C	A	C	B	E	B	D	C
Approach Delay		19.1			17.4		58.5		37.4
Approach LOS		B			B		E		D

Intersection Summary

Cycle Length: 140  
 Actuated Cycle Length: 119.4  
 Natural Cycle: 90  
 Control Type: Semi Act-Uncoord  
 Maximum v/c Ratio: 0.97  
 Intersection Signal Delay: 28.9  
 Intersection LOS: C  
 Intersection Capacity Utilization 69.7%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 2: Station Road & King Street West



HCM Signalized Intersection Capacity Analysis  
2: Station Road & King Street West

2041 Grade Separation + Improvements  
Timing Plan: Weekday PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	697	263	29	762	19	356	15	28	9	5	14
Future Volume (vph)	32	697	263	29	762	19	356	15	28	9	5	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.1	4.0		1.5	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frbp, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.90		1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1804	1863	1495	1805	3416		1805	1710		1805	1710	
Flt Permitted	0.26	1.00	1.00	0.19	1.00		0.63	1.00		0.72	1.00	
Satd. Flow (perm)	497	1863	1495	352	3416		1204	1710		1364	1710	
Peak-hour factor, PHF	0.89	0.94	0.75	0.56	0.93	0.59	0.55	0.75	0.70	0.56	0.42	0.58
Adj. Flow (vph)	36	741	351	52	819	32	647	20	40	16	12	24
RTOR Reduction (vph)	0	0	114	0	2	0	0	25	0	0	22	0
Lane Group Flow (vph)	36	741	237	52	849	0	647	35	0	16	14	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	0%	2%	8%	0%	5%	5%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		2			2		7	4			8	
Permitted Phases	2		2	2			4			8		
Actuated Green, G (s)	63.1	63.1	63.1	63.1	63.1		44.6	44.6		6.5	6.5	
Effective Green, g (s)	66.2	66.2	66.2	66.1	66.2		47.6	46.6		8.5	8.5	
Actuated g/C Ratio	0.55	0.55	0.55	0.55	0.55		0.39	0.39		0.07	0.07	
Clearance Time (s)	7.1	7.1	7.1	7.1	7.1		4.5	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	272	1020	819	192	1872		656	659		95	120	
v/s Ratio Prot		c0.40			0.25		c0.30	0.02			0.01	
v/s Ratio Perm	0.07		0.16	0.15			0.09			0.01		
v/c Ratio	0.13	0.73	0.29	0.27	0.45		0.99	0.05		0.17	0.11	
Uniform Delay, d1	13.3	20.5	14.7	14.5	16.4		34.8	23.3		52.8	52.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	4.5	0.9	3.4	0.8		31.4	0.0		0.8	0.4	
Delay (s)	14.3	25.0	15.6	18.0	17.2		66.2	23.3		53.7	53.0	
Level of Service	B	C	B	B	B		E	C		D	D	
Approach Delay (s)		21.7			17.3			62.6			53.2	
Approach LOS		C			B			E			D	

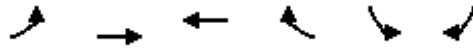
Intersection Summary

HCM 2000 Control Delay	31.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.8	Sum of lost time (s)	9.5
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis 2041 Grade Separation + Improvements  
 3: Old Ellwood Drive & Station Road

Timing Plan: Weekday PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↗		↙	
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	0	9	31	461	154	0
Future Volume (vph)	0	9	31	461	154	0
Peak Hour Factor	0.63	0.76	0.86	0.94	0.78	0.42
Hourly flow rate (vph)	0	12	36	490	197	0

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	12	526	197
Volume Left (vph)	0	0	197
Volume Right (vph)	0	490	0
Hadj (s)	0.00	-0.56	0.20
Departure Headway (s)	5.0	3.9	5.2
Degree Utilization, x	0.02	0.57	0.29
Capacity (veh/h)	660	889	640
Control Delay (s)	8.1	12.0	10.3
Approach Delay (s)	8.1	12.0	10.3
Approach LOS	A	B	B

Intersection Summary			
Delay		11.5	
Level of Service		B	
Intersection Capacity Utilization	45.3%	ICU Level of Service	A
Analysis Period (min)	15		

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	LT	R	L	L	T	R	L	T	T	R	L	L
Maximum Queue (m)	46.0	23.4	36.2	39.9	57.6	103.3	98.9	115.2	129.5	105.6	94.9	94.0
Average Queue (m)	22.5	11.9	15.4	19.7	24.4	43.6	55.0	71.5	73.2	37.4	61.3	58.0
95th Queue (m)	41.0	19.8	30.1	33.6	49.5	90.4	88.1	105.4	109.6	78.7	87.7	85.5
Link Distance (m)	234.3				480.2		480.2		1016.3		1016.3	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	20.0		57.0		57.0		58.0		35.0		70.0	
Storage Blk Time (%)	18	1			0		9	19	40	6	6	4
Queuing Penalty (veh)	23	1			1		31	48	137	19	6	4

**Intersection: 1: Coleraine Drive & Harvest Moon Drive/King Street West**

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	43.0	48.0
Average Queue (m)	19.2	22.7
95th Queue (m)	37.5	42.0
Link Distance (m)	904.7	904.7
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

**Intersection: 2: Station Road & King Street West**

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB		
Directions Served	L	T	R	L	T	TR	L	TR	L	TR		
Maximum Queue (m)	76.0	149.0	39.3	25.7	63.8	70.6	91.6	94.7	13.7	14.1		
Average Queue (m)	7.7	64.3	13.5	6.3	29.6	33.5	54.6	12.3	2.5	4.7		
95th Queue (m)	38.4	127.5	29.9	16.9	52.5	59.9	85.9	52.0	8.9	12.7		
Link Distance (m)	480.2		480.2		153.3		153.3		647.5		211.1	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	23.0		75.0		28.0		30.0					
Storage Blk Time (%)	0	21			0		37	0				
Queuing Penalty (veh)	0	7			0		16	0				



Intersection: 3: Old Ellwood Drive & Station Road

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	9.2	40.4	20.6
Average Queue (m)	2.8	19.2	12.4
95th Queue (m)	9.6	30.7	19.2
Link Distance (m)	256.1	192.0	647.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 292

# Junctions 9

## ARCADY 9 - Roundabout Module

Version: 9.0.1.4646 []  
© Copyright TRL Limited, 2017

For sales and distribution information, program advice and maintenance, contact TRL:  
Tel: +44 (0)1344 770758 email: software@trl.co.uk Web: http://www.trlsoftware.co.uk

The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

Filename: B000738 - CA01.j9

Path: Z:\Cima-C11\Project\C11-08\B000738\_Peel-CP Grade Separation EA\300\_CALCULATIONS\ARCADY

Report generation date: 6/7/2017 8:43:11 AM

- »C-90 - 2041, AM
- »C-90 - 2041, PM
- »C-90 - 2041 Grade Separated, AM
- »C-90 - 2041 Grade Separated, PM
- »C-100 - 2041, AM
- »C-100 - 2041, PM
- »C-100 - 2041 Grade Separated, AM
- »C-100 - 2041 Grade Separated, PM

### Summary of intersection performance

	AM							PM						
	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Network Residual Capacity
<b>C-90 - 2041</b>														
1 - SB Emil Kolb	27.5	16.35	0.85	C	22.94	C	-7 % [2 - EB Harvest Moon]	1.9	5.03	0.49	A	16.81	C	3 % [3 - NB Coleraine]
2 - EB Harvest Moon	9.8	85.18	0.72	F				0.5	7.13	0.18	A			
3 - NB Coleraine	1.3	3.23	0.23	A				48.3	23.05	0.91	C			
4 - WB King St	2.3	10.19	0.60	B				5.9	19.48	0.57	C			
<b>C-90 - 2041 Grade Separated</b>														
1 - SB Emil Kolb	31.6	19.25	0.87	C	68.98	F	-13 % [2 - EB Harvest Moon]	2.1	4.67	0.47	A	5.10	A	61 % [1 - SB Emil Kolb]
2 - EB Harvest Moon	35.4	394.77	1.29	F				1.0	7.19	0.19	A			
3 - NB Coleraine	1.0	3.31	0.21	A				2.8	3.76	0.38	A			
4 - WB King St	6.2	11.67	0.68	B				2.7	6.53	0.41	A			
<b>C-100 - 2041</b>														
1 - SB Emil Kolb	3.4	5.98	0.67	A	7.70	A	7 % [2 - EB Harvest Moon]	2.8	3.29	0.39	A	6.40	A	27 % [3 - NB Coleraine]
2 - EB Harvest Moon	2.0	20.26	0.36	C				0.5	5.10	0.13	A			
3 - NB Coleraine	0.5	2.42	0.19	A				5.1	6.38	0.72	A			
4 - WB King St	2.1	6.19	0.48	A				3.2	9.97	0.40	A			
<b>C-100 - 2041 Grade Separated</b>														
1 - SB Emil Kolb	3.6	6.35	0.68	A	10.07	B	0 % [2 - EB Harvest Moon]	2.8	3.08	0.37	A	3.51	A	92 % [1 - SB Emil Kolb]
2 - EB Harvest Moon	6.3	34.13	0.57	D				0.5	5.13	0.14	A			
3 - NB Coleraine	0.5	2.52	0.16	A				1.5	2.62	0.30	A			
4 - WB King St	1.5	6.64	0.54	A				2.2	4.58	0.33	A			

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and

Intersection Delay are demand-weighted averages. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

## File summary

### File Description

Title	(untitled)
Location	
Site number	
Date	3/6/2015
Version	
Status	Conceptual
Identifier	
Client	
Jobnumber	
Analyst	
Description	

## Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin

## Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	Residual capacity criteria type	V/C Ratio Threshold	Average Delay threshold (s)	Queue threshold (PCE)
7.00	✓		✓	Delay	0.85	36.00	20.00

## Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D1	2041	AM	ONE HOUR	07:45	09:15	15	✓	✓
D2	2041	PM	ONE HOUR	07:45	09:15	15	✓	✓
D3	2041 Grade Separated	AM	ONE HOUR	07:45	09:15	15	✓	✓
D4	2041 Grade Separated	PM	ONE HOUR	07:45	09:15	15	✓	✓

# C-90 - 2041, AM

## Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D1 - 2041, AM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

## Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	C-90	✓	100.000	100.000

## Intersection Network

### Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
1	Intersection 1	Standard Roundabout	1,2,3,4	22.94	C

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	-7	2 - EB Harvest Moon

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

## Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

## Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

## Slope / Intercept / Capacity

### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00

### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2242
2 - EB Harvest Moon	0.565	1218
3 - NB Coleraine	0.797	2242
4 - WB King St	0.556	1199

The slope and intercept shown above include any corrections and adjustments.

### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00

## Traffic Demand

### Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D1	2041	AM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	1248	89.000
2 - EB Harvest Moon		ONE HOUR	✓	464	89.000
3 - NB Coleraine		ONE HOUR	✓	349	89.000
4 - WB King St		ONE HOUR	✓	982	89.000

## Origin-Destination Data

### Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	5	944	299
	2 - EB Harvest Moon	4	0	364	96
	3 - NB Coleraine	215	43	0	91
	4 - WB King St	431	35	516	0

## Vehicle Mix

### Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	2	4	13	2
	2 - EB Harvest Moon	25	2	3	8
	3 - NB Coleraine	27	2	2	7
	4 - WB King St	2	6	3	2

## Results

### Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.85	16.35	5.3	27.5	C	1111	1111
2 - EB Harvest Moon	0.72	85.18	2.1	9.8	F	396	89
3 - NB Coleraine	0.23	3.23	0.3	1.3	A	311	311
4 - WB King St	0.60	10.19	1.5	2.3	B	870	490

### Main Results for each time segment

08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	345	474	1512	0.661	995	175	1.1	1.9	6.933	A
2 - EB Harvest Moon	356	80	20	291	0	1403	298	0.268	79	66	0.2	0.4	16.408	C
3 - NB Coleraine	279	279	70	0	291	318	1501	0.186	279	1165	0.2	0.2	2.945	A
4 - WB King St	782	441	110	345	0	209	921	0.479	440	387	0.6	0.9	7.464	A

#### 08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	422	580	1441	0.849	1210	214	1.9	5.1	14.860	B
2 - EB Harvest Moon	436	98	24	357	0	1709	143	0.684	92	81	0.4	1.7	65.142	F
3 - NB Coleraine	342	342	85	0	357	382	1461	0.234	342	1419	0.2	0.3	3.216	A
4 - WB King St	957	540	135	422	0	256	893	0.605	538	468	0.9	1.5	10.060	B

#### 08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	422	582	1439	0.850	1222	215	5.1	5.3	16.351	C
2 - EB Harvest Moon	436	98	24	357	0	1722	136	0.718	96	81	1.7	2.1	85.181	F
3 - NB Coleraine	342	342	85	0	357	389	1456	0.235	342	1430	0.3	0.3	3.229	A
4 - WB King St	957	540	135	422	0	257	893	0.605	540	475	1.5	1.5	10.192	B

#### 08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	345	478	1509	0.662	1012	176	5.3	2.0	7.422	A
2 - EB Harvest Moon	356	80	20	291	0	1423	288	0.278	87	67	2.1	0.4	18.469	C
3 - NB Coleraine	279	279	70	0	291	329	1494	0.187	280	1180	0.3	0.2	2.964	A
4 - WB King St	782	441	110	345	0	210	921	0.479	443	399	1.5	0.9	7.577	A

### Queue Variation Results for each time segment

#### 08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	1.90	0.05	0.48	5.07	8.19			N/A	N/A
2 - EB Harvest Moon	0.36	0.03	0.28	0.54	1.02			N/A	N/A

3 - NB Coleraine	0.23	0.00	0.00	0.23	0.23			N/A	N/A
4 - WB King St	0.90	0.11	0.91	1.25	1.68			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	5.06	0.03	0.35	10.66	27.52			N/A	N/A
2 - EB Harvest Moon	1.75	0.04	0.35	4.30	9.01			N/A	N/A
3 - NB Coleraine	0.30	0.03	0.25	0.45	0.48			N/A	N/A
4 - WB King St	1.49	0.03	0.27	1.49	1.94			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	5.33	0.03	0.30	5.33	21.58			N/A	N/A
2 - EB Harvest Moon	2.12	0.04	0.45	5.80	9.78			N/A	N/A
3 - NB Coleraine	0.31	0.03	0.31	1.01	1.28			N/A	N/A
4 - WB King St	1.51	0.03	0.27	1.51	2.33			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	2.00	0.05	0.47	5.40	8.81			N/A	N/A
2 - EB Harvest Moon	0.39	0.03	0.34	1.08	1.08			N/A	N/A
3 - NB Coleraine	0.23	0.00	0.00	0.23	0.23			N/A	N/A
4 - WB King St	0.93	0.09	0.90	1.48	1.84			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			90.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	90.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			90.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	90.00

## C-90 - 2041, PM

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D2 - 2041, PM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

### Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	C-90	✓	100.000	100.000

## Intersection Network

### Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
1	Intersection 1	Standard Roundabout	1,2,3,4	16.81	C

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	3	3 - NB Coleraine

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

## Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

## Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

## Slope / Intercept / Capacity

### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00

### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2242
2 - EB Harvest Moon	0.565	1218
3 - NB Coleraine	0.797	2242
4 - WB King St	0.556	1199

The slope and intercept shown above include any corrections and adjustments.

### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00

## Traffic Demand

### Demand Set Details



ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D2	2041	PM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	709	89.000
2 - EB Harvest Moon		ONE HOUR	✓	259	89.000
3 - NB Coleraine		ONE HOUR	✓	1500	89.000
4 - WB King St		ONE HOUR	✓	787	89.000

## Origin-Destination Data

### Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	9	353	347
	2 - EB Harvest Moon	6	0	148	105
	3 - NB Coleraine	873	363	0	264
	4 - WB King St	537	94	156	0

## Vehicle Mix

### Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	2	2	23	1
	2 - EB Harvest Moon	2	2	2	2
	3 - NB Coleraine	7	2	2	1
	4 - WB King St	1	2	2	2

## Results

### Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.49	5.03	1.0	1.9	A	631	631
2 - EB Harvest Moon	0.18	7.13	0.2	0.5	A	231	99
3 - NB Coleraine	0.91	23.05	8.9	48.3	C	1335	1335
4 - WB King St	0.57	19.48	1.3	5.9	C	696	223

### Main Results for each time segment

08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	430	489	1483	0.382	567	701	0.4	0.6	3.924	A
2 - EB Harvest Moon	207	89	22	118	0	684	699	0.127	89	371	0.1	0.1	5.898	A
3 - NB Coleraine	1200	1200	300	0	118	366	1673	0.717	1196	406	1.4	2.5	7.473	A
4 - WB King St	625	200	50	430	0	990	545	0.367	199	572	0.4	0.6	10.379	B

#### 08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	526	593	1415	0.491	693	848	0.6	1.0	4.977	A
2 - EB Harvest Moon	254	109	27	145	0	836	615	0.177	108	450	0.1	0.2	7.103	A
3 - NB Coleraine	1470	1470	367	0	145	448	1617	0.909	1447	496	2.5	8.1	19.165	C
4 - WB King St	766	245	61	526	0	1199	437	0.560	242	697	0.6	1.2	18.239	C

#### 08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	526	600	1411	0.492	695	859	1.0	1.0	5.026	A
2 - EB Harvest Moon	254	109	27	145	0	839	614	0.177	109	456	0.2	0.2	7.129	A
3 - NB Coleraine	1470	1470	367	0	145	449	1616	0.910	1467	499	8.1	8.9	23.046	C
4 - WB King St	766	245	61	526	0	1214	429	0.571	245	701	1.2	1.3	19.480	C

#### 08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	430	499	1476	0.384	569	718	1.0	0.6	3.971	A
2 - EB Harvest Moon	207	89	22	118	0	688	697	0.127	89	380	0.2	0.1	5.930	A
3 - NB Coleraine	1200	1200	300	0	118	367	1672	0.718	1225	410	8.9	2.6	8.475	A
4 - WB King St	625	200	50	430	0	1014	533	0.376	203	578	1.3	0.6	11.000	B

### Queue Variation Results for each time segment

#### 08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.61	0.09	0.81	1.36	1.43			N/A	N/A
2 - EB Harvest Moon	0.14	0.00	0.00	0.14	0.14			N/A	N/A

3 - NB Coleraine	2.47	0.05	0.46	6.81	11.42			N/A	N/A
4 - WB King St	0.57	0.07	0.74	1.35	1.42			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.95	0.03	0.26	0.95	0.95			N/A	N/A
2 - EB Harvest Moon	0.21	0.03	0.26	0.46	0.49			N/A	N/A
3 - NB Coleraine	8.08	0.05	0.47	22.75	42.43			N/A	N/A
4 - WB King St	1.22	0.03	0.28	1.22	2.98			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.96	0.03	0.27	0.96	1.89			N/A	N/A
2 - EB Harvest Moon	0.21	0.03	0.26	0.47	0.50			N/A	N/A
3 - NB Coleraine	8.87	0.04	0.35	17.98	48.28			N/A	N/A
4 - WB King St	1.29	0.03	0.30	1.40	5.91			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.63	0.55	1.00	1.40	1.45			N/A	N/A
2 - EB Harvest Moon	0.15	0.00	0.00	0.15	0.15			N/A	N/A
3 - NB Coleraine	2.62	0.04	0.43	7.22	12.80			N/A	N/A
4 - WB King St	0.61	0.05	0.58	1.36	1.46			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			90.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	90.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			90.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	90.00

# C-90 - 2041 Grade Separated, AM

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D3 - 2041 Grade Separated, AM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

### Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	C-90	✓	100.000	100.000

## Intersection Network

### Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
--------------	------	-------------------	-----------	------------------------	------------------

1	Intersection 1	Standard Roundabout	1,2,3,4	68.98	F
---	----------------	---------------------	---------	-------	---

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	-13	2 - EB Harvest Moon

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

### Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

### Slope / Intercept / Capacity

#### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00

#### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2242
2 - EB Harvest Moon	0.565	1218
3 - NB Coleraine	0.797	2242
4 - WB King St	0.556	1199

The slope and intercept shown above include any corrections and adjustments.

#### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00

## Traffic Demand

## Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D3	2041 Grade Separated	AM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	1248	89.000
2 - EB Harvest Moon		ONE HOUR	✓	464	89.000
3 - NB Coleraine		ONE HOUR	✓	286	89.000
4 - WB King St		ONE HOUR	✓	1173	89.000

## Origin-Destination Data

### Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	5	748	495
	2 - EB Harvest Moon	4	0	324	136
	3 - NB Coleraine	132	21	0	133
	4 - WB King St	514	57	602	0

## Vehicle Mix

### Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	2	4	13	2
	2 - EB Harvest Moon	25	2	3	8
	3 - NB Coleraine	27	2	2	7
	4 - WB King St	2	6	3	2

## Results

### Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.87	19.25	6.2	31.6	C	1111	1111
2 - EB Harvest Moon	1.29	394.77	17.0	35.4	F	398	125
3 - NB Coleraine	0.21	3.31	0.3	1.0	A	255	255
4 - WB King St	0.68	11.67	2.1	6.2	B	1038	587

### Main Results for each time segment

08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	411	543	1489	0.671	995	109	1.2	2.0	7.247	A
2 - EB Harvest Moon	358	112	28	259	0	1472	274	0.409	111	66	0.3	0.7	21.879	C
3 - NB Coleraine	229	229	57	0	259	505	1418	0.161	229	1077	0.1	0.2	3.025	A
4 - WB King St	933	527	132	411	0	125	970	0.544	526	608	0.8	1.2	8.077	A

08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	504	663	1407	0.869	1208	132	2.0	5.8	16.928	C
2 - EB Harvest Moon	439	137	34	317	0	1790	115	1.198	105	81	0.7	8.8	212.310	F
3 - NB Coleraine	280	280	70	0	317	584	1369	0.205	280	1311	0.2	0.3	3.304	A
4 - WB King St	1143	646	161	504	0	153	954	0.677	642	711	1.2	2.0	11.436	B

08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	504	666	1404	0.871	1221	132	5.8	6.2	19.254	C
2 - EB Harvest Moon	439	137	34	317	0	1806	106	1.292	104	81	8.8	17.0	394.768	F
3 - NB Coleraine	280	280	70	0	317	589	1366	0.205	280	1322	0.3	0.3	3.314	A
4 - WB King St	1143	646	161	504	0	153	954	0.677	646	716	2.0	2.1	11.675	B

08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	411	547	1485	0.672	1015	111	6.2	2.1	7.912	A
2 - EB Harvest Moon	358	112	28	259	0	1496	262	0.428	177	67	17.0	0.8	74.241	F
3 - NB Coleraine	229	229	57	0	259	579	1369	0.167	229	1093	0.3	0.2	3.160	A
4 - WB King St	933	527	132	411	0	128	969	0.544	531	681	2.1	1.2	8.280	A

Queue Variation Results for each time segment

08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	999	999	250	0	411	543	1489	0.671	995
2 - EB Harvest Moon	358	112	28	259	0	1472	274	0.409	111
3 - NB Coleraine	229	229	57	0	259	505	1418	0.161	229
4 - WB King St	933	527	132	411	0	125	970	0.544	526

1 - SB Emil Kolb	1.99	0.05	0.47	5.37	8.74			N/A	N/A
2 - EB Harvest Moon	0.67	0.03	0.34	1.54	2.81			N/A	N/A
3 - NB Coleraine	0.19	0.00	0.00	0.19	0.19			N/A	N/A
4 - WB King St	1.17	0.08	0.97	2.09	2.84			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	5.82	0.04	0.38	14.29	31.64			N/A	N/A
2 - EB Harvest Moon	8.83	1.08	6.93	16.66	20.43			N/A	N/A
3 - NB Coleraine	0.26	0.03	0.25	0.46	0.48			N/A	N/A
4 - WB King St	2.02	0.03	0.28	2.02	6.17			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	6.23	0.03	0.31	7.40	29.61			N/A	N/A
2 - EB Harvest Moon	17.02	4.08	14.66	29.80	35.38			N/A	N/A
3 - NB Coleraine	0.26	0.03	0.28	0.50	0.98			N/A	N/A
4 - WB King St	2.06	0.03	0.27	2.06	3.16			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	2.10	0.04	0.45	5.74	9.68			N/A	N/A
2 - EB Harvest Moon	0.81	0.03	0.28	0.83	3.00			N/A	N/A
3 - NB Coleraine	0.20	0.00	0.00	0.20	0.20			N/A	N/A
4 - WB King St	1.22	0.07	0.90	2.47	3.38			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			90.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	90.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			90.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	90.00

## C-90 - 2041 Grade Separated, PM

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D4 - 2041 Grade Separated, PM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

### Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	C-90	✓	100.000	100.000

## Intersection Network

## Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
1	Intersection 1	Standard Roundabout	1,2,3,4	5.10	A

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	61	1 - SB Emil Kolb

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

## Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

## Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

## Slope / Intercept / Capacity

### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00

### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2242
2 - EB Harvest Moon	0.565	1218
3 - NB Coleraine	0.797	2242
4 - WB King St	0.556	1199

*The slope and intercept shown above include any corrections and adjustments.*

### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		90.00
2 - EB Harvest Moon	Percentage		90.00
3 - NB Coleraine	Percentage		90.00
4 - WB King St	Percentage		90.00



# Traffic Demand

## Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D4	2041 Grade Separated	PM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	709	89.000
2 - EB Harvest Moon		ONE HOUR	✓	253	89.000
3 - NB Coleraine		ONE HOUR	✓	591	89.000
4 - WB King St		ONE HOUR	✓	394	89.000

## Origin-Destination Data

### Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	9	174	526
	2 - EB Harvest Moon	0	0	132	121
	3 - NB Coleraine	0	247	0	344
	4 - WB King St	0	210	184	0

## Vehicle Mix

### Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	2	23	1
	2 - EB Harvest Moon	0	2	2	2
	3 - NB Coleraine	0	2	2	1
	4 - WB King St	0	2	2	2

## Results

### Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.47	4.67	0.9	2.1	A	631	631
2 - EB Harvest Moon	0.19	7.19	0.2	1.0	A	225	108
3 - NB Coleraine	0.38	3.76	0.6	2.8	A	526	526
4 - WB King St	0.41	6.53	0.7	2.7	A	351	351

## Main Results for each time segment

### 08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	0	512	1545	0.367	567	0	0.4	0.6	3.679	A
2 - EB Harvest Moon	202	97	24	106	0	706	703	0.138	97	372	0.1	0.2	5.936	A
3 - NB Coleraine	473	473	118	0	106	517	1620	0.292	472	286	0.3	0.4	3.137	A
4 - WB King St	315	315	79	0	0	197	959	0.329	315	792	0.4	0.5	5.583	A

### 08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	0	627	1466	0.474	693	0	0.6	0.9	4.654	A
2 - EB Harvest Moon	248	119	30	129	0	865	620	0.191	118	456	0.2	0.2	7.174	A
3 - NB Coleraine	579	579	145	0	129	633	1537	0.377	578	350	0.4	0.6	3.750	A
4 - WB King St	386	386	97	0	0	242	937	0.412	385	969	0.5	0.7	6.515	A

### 08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	0	628	1465	0.474	695	0	0.9	0.9	4.673	A
2 - EB Harvest Moon	248	119	30	129	0	866	619	0.192	119	457	0.2	0.2	7.194	A
3 - NB Coleraine	579	579	145	0	129	634	1536	0.377	579	351	0.6	0.6	3.759	A
4 - WB King St	386	386	97	0	0	242	937	0.412	386	971	0.7	0.7	6.535	A

### 08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	0	514	1543	0.368	569	0	0.9	0.6	3.699	A
2 - EB Harvest Moon	202	97	24	106	0	709	702	0.138	97	374	0.2	0.2	5.957	A
3 - NB Coleraine	473	473	118	0	106	519	1619	0.292	474	287	0.6	0.4	3.144	A
4 - WB King St	315	315	79	0	0	198	959	0.329	316	795	0.7	0.5	5.608	A

## Queue Variation Results for each time segment

### 08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.58	0.08	0.77	1.35	1.43			N/A	N/A
2 - EB Harvest Moon	0.16	0.00	0.00	0.16	0.16			N/A	N/A
3 - NB Coleraine	0.41	0.00	0.00	0.41	0.41			N/A	N/A
4 - WB King St	0.49	0.00	0.00	0.49	0.49			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.89	0.03	0.26	0.89	0.89			N/A	N/A
2 - EB Harvest Moon	0.23	0.03	0.26	0.46	0.49			N/A	N/A
3 - NB Coleraine	0.60	0.03	0.25	0.60	0.60			N/A	N/A
4 - WB King St	0.69	0.03	0.25	0.69	0.69			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.90	0.03	0.27	0.90	2.11			N/A	N/A
2 - EB Harvest Moon	0.24	0.03	0.28	0.50	0.96			N/A	N/A
3 - NB Coleraine	0.60	0.03	0.29	1.30	2.79			N/A	N/A
4 - WB King St	0.70	0.03	0.28	0.87	2.73			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.58	0.55	1.00	1.40	1.45			N/A	N/A
2 - EB Harvest Moon	0.16	0.00	0.00	0.16	0.16			N/A	N/A
3 - NB Coleraine	0.41	0.00	0.00	0.41	0.41			N/A	N/A
4 - WB King St	0.49	0.00	0.00	0.49	0.49			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			90.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	90.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			90.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	90.00

## C-100 - 2041, AM

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D1 - 2041, AM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

### Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	C-100	✓	100.000	100.000

## Intersection Network

## Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
1	Intersection 1	Standard Roundabout	1,2,3,4	7.70	A

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	7	2 - EB Harvest Moon

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

## Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

## Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

## Slope / Intercept / Capacity

### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00

### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2492
2 - EB Harvest Moon	0.565	1353
3 - NB Coleraine	0.797	2492
4 - WB King St	0.556	1332

The slope and intercept shown above include any corrections and adjustments.

### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00

# Traffic Demand

## Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D1	2041	AM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	1248	89.000
2 - EB Harvest Moon		ONE HOUR	✓	464	89.000
3 - NB Coleraine		ONE HOUR	✓	349	89.000
4 - WB King St		ONE HOUR	✓	982	89.000

## Origin-Destination Data

### Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	5	944	299
	2 - EB Harvest Moon	4	0	364	96
	3 - NB Coleraine	215	43	0	91
	4 - WB King St	431	35	516	0

## Vehicle Mix

### Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	2	4	13	2
	2 - EB Harvest Moon	25	2	3	8
	3 - NB Coleraine	27	2	2	7
	4 - WB King St	2	6	3	2

## Results

### Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.67	5.98	2.0	3.4	A	1111	1111
2 - EB Harvest Moon	0.36	20.26	0.5	2.0	C	396	89
3 - NB Coleraine	0.19	2.42	0.2	0.5	A	311	311
4 - WB King St	0.48	6.19	0.9	2.1	A	870	490

## Main Results for each time segment

### 08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	345	475	1905	0.524	997	175	0.7	1.1	3.958	A
2 - EB Harvest Moon	356	80	20	291	0	1405	455	0.176	80	66	0.1	0.2	9.594	A
3 - NB Coleraine	279	279	70	0	291	319	1877	0.149	279	1166	0.1	0.2	2.252	A
4 - WB King St	782	441	110	345	0	210	1152	0.383	440	388	0.5	0.6	5.050	A

### 08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	422	581	1826	0.670	1219	214	1.1	2.0	5.899	A
2 - EB Harvest Moon	436	98	24	357	0	1719	278	0.352	97	81	0.2	0.5	19.719	C
3 - NB Coleraine	342	342	85	0	357	389	1828	0.187	342	1427	0.2	0.2	2.421	A
4 - WB King St	957	540	135	422	0	257	1121	0.482	539	474	0.6	0.9	6.167	A

### 08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	422	582	1825	0.670	1223	215	2.0	2.0	5.976	A
2 - EB Harvest Moon	436	98	24	357	0	1724	275	0.356	98	81	0.5	0.5	20.261	C
3 - NB Coleraine	342	342	85	0	357	391	1827	0.187	342	1431	0.2	0.2	2.423	A
4 - WB King St	957	540	135	422	0	257	1121	0.482	540	476	0.9	0.9	6.193	A

### 08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	345	476	1904	0.525	1002	175	2.0	1.1	4.008	A
2 - EB Harvest Moon	356	80	20	291	0	1412	451	0.178	81	67	0.5	0.2	9.776	A
3 - NB Coleraine	279	279	70	0	291	321	1875	0.149	279	1172	0.2	0.2	2.255	A
4 - WB King St	782	441	110	345	0	210	1152	0.383	442	391	0.9	0.6	5.077	A

## Queue Variation Results for each time segment

### 08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	1.09	0.06	0.66	2.36	3.38			N/A	N/A
2 - EB Harvest Moon	0.21	0.00	0.00	0.21	0.21			N/A	N/A
3 - NB Coleraine	0.17	0.00	0.00	0.17	0.17			N/A	N/A
4 - WB King St	0.61	0.11	0.86	1.37	1.44			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	1.99	0.03	0.27	1.99	1.99			N/A	N/A
2 - EB Harvest Moon	0.53	0.03	0.26	0.53	0.53			N/A	N/A
3 - NB Coleraine	0.23	0.03	0.25	0.46	0.48			N/A	N/A
4 - WB King St	0.92	0.03	0.26	0.92	0.92			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	2.01	0.03	0.26	2.01	2.01			N/A	N/A
2 - EB Harvest Moon	0.54	0.03	0.34	1.11	1.99			N/A	N/A
3 - NB Coleraine	0.23	0.03	0.25	0.45	0.48			N/A	N/A
4 - WB King St	0.92	0.03	0.27	0.92	2.07			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	1.11	0.13	1.05	1.73	1.99			N/A	N/A
2 - EB Harvest Moon	0.22	0.00	0.00	0.22	0.22			N/A	N/A
3 - NB Coleraine	0.18	0.00	0.00	0.18	0.18			N/A	N/A
4 - WB King St	0.63	0.17	0.91	1.38	1.44			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			100.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	100.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			100.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	100.00

## C-100 - 2041, PM

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D2 - 2041, PM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

### Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	C-100	✓	100.000	100.000

## Intersection Network

## Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
1	Intersection 1	Standard Roundabout	1,2,3,4	6.40	A

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	27	3 - NB Coleraine

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

## Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

## Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

## Slope / Intercept / Capacity

### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00

### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2492
2 - EB Harvest Moon	0.565	1353
3 - NB Coleraine	0.797	2492
4 - WB King St	0.556	1332

*The slope and intercept shown above include any corrections and adjustments.*

### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00



# Traffic Demand

## Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D2	2041	PM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	709	89.000
2 - EB Harvest Moon		ONE HOUR	✓	259	89.000
3 - NB Coleraine		ONE HOUR	✓	1500	89.000
4 - WB King St		ONE HOUR	✓	787	89.000

# Origin-Destination Data

## Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	9	353	347
	2 - EB Harvest Moon	6	0	148	105
	3 - NB Coleraine	873	363	0	264
	4 - WB King St	537	94	156	0

# Vehicle Mix

## Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	2	2	23	1
	2 - EB Harvest Moon	2	2	2	2
	3 - NB Coleraine	7	2	2	1
	4 - WB King St	1	2	2	2

# Results

## Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.39	3.29	0.6	2.8	A	631	631
2 - EB Harvest Moon	0.13	5.10	0.2	0.5	A	231	99
3 - NB Coleraine	0.72	6.38	2.6	5.1	A	1335	1335
4 - WB King St	0.40	9.97	0.7	3.2	A	696	223

## Main Results for each time segment

### 08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	430	490	1870	0.303	567	702	0.3	0.4	2.762	A
2 - EB Harvest Moon	207	89	22	118	0	684	909	0.098	89	372	0.1	0.1	4.389	A
3 - NB Coleraine	1200	1200	300	0	118	366	2097	0.572	1198	407	0.9	1.3	3.997	A
4 - WB King St	625	200	50	430	0	992	735	0.272	200	572	0.3	0.4	6.715	A

### 08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	526	598	1791	0.388	694	858	0.4	0.6	3.280	A
2 - EB Harvest Moon	254	109	27	145	0	837	815	0.133	109	455	0.1	0.2	5.092	A
3 - NB Coleraine	1470	1470	367	0	145	448	2034	0.723	1465	498	1.3	2.5	6.275	A
4 - WB King St	766	245	61	526	0	1213	608	0.403	244	700	0.4	0.7	9.852	A

### 08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	526	601	1789	0.388	695	861	0.6	0.6	3.287	A
2 - EB Harvest Moon	254	109	27	145	0	839	814	0.134	109	457	0.2	0.2	5.101	A
3 - NB Coleraine	1470	1470	367	0	145	449	2033	0.723	1470	499	2.5	2.6	6.382	A
4 - WB King St	766	245	61	526	0	1217	606	0.404	245	702	0.7	0.7	9.974	A

### 08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	430	493	1868	0.304	568	706	0.6	0.4	2.773	A
2 - EB Harvest Moon	207	89	22	118	0	686	908	0.098	89	374	0.2	0.1	4.400	A
3 - NB Coleraine	1200	1200	300	0	118	367	2096	0.572	1205	408	2.6	1.4	4.060	A
4 - WB King St	625	200	50	430	0	998	732	0.273	201	574	0.7	0.4	6.796	A

## Queue Variation Results for each time segment

### 08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.43	0.00	0.00	0.43	0.43			N/A	N/A
2 - EB Harvest Moon	0.11	0.00	0.00	0.11	0.11			N/A	N/A
3 - NB Coleraine	1.32	0.05	0.48	3.29	5.05			N/A	N/A
4 - WB King St	0.37	0.00	0.00	0.37	0.37			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.63	0.03	0.25	0.63	0.63			N/A	N/A
2 - EB Harvest Moon	0.15	0.03	0.26	0.46	0.49			N/A	N/A
3 - NB Coleraine	2.54	0.03	0.27	2.54	3.44			N/A	N/A
4 - WB King St	0.66	0.03	0.26	0.66	0.66			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.63	0.03	0.29	1.19	2.82			N/A	N/A
2 - EB Harvest Moon	0.15	0.03	0.25	0.45	0.48			N/A	N/A
3 - NB Coleraine	2.58	0.03	0.26	2.58	2.58			N/A	N/A
4 - WB King St	0.67	0.03	0.30	1.02	3.22			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.44	0.00	0.00	0.44	0.44			N/A	N/A
2 - EB Harvest Moon	0.11	0.00	0.00	0.11	0.11			N/A	N/A
3 - NB Coleraine	1.35	0.10	1.10	2.55	3.32			N/A	N/A
4 - WB King St	0.38	0.00	0.00	0.38	0.38			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			100.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	100.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			100.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	100.00

# C-100 - 2041 Grade Separated, AM

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D3 - 2041 Grade Separated, AM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

### Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	C-100	✓	100.000	100.000

## Intersection Network

## Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
1	Intersection 1	Standard Roundabout	1,2,3,4	10.07	B

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	0	2 - EB Harvest Moon

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

## Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

## Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

## Slope / Intercept / Capacity

### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00

### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2492
2 - EB Harvest Moon	0.565	1353
3 - NB Coleraine	0.797	2492
4 - WB King St	0.556	1332

*The slope and intercept shown above include any corrections and adjustments.*

### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00

# Traffic Demand

## Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D3	2041 Grade Separated	AM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	1248	89.000
2 - EB Harvest Moon		ONE HOUR	✓	464	89.000
3 - NB Coleraine		ONE HOUR	✓	286	89.000
4 - WB King St		ONE HOUR	✓	1173	89.000

## Origin-Destination Data

### Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	5	748	495
	2 - EB Harvest Moon	4	0	324	136
	3 - NB Coleraine	132	21	0	133
	4 - WB King St	514	57	602	0

## Vehicle Mix

### Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	2	4	13	2
	2 - EB Harvest Moon	25	2	3	8
	3 - NB Coleraine	27	2	2	7
	4 - WB King St	2	6	3	2

## Results

### Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.68	6.35	2.1	3.6	A	1111	1111
2 - EB Harvest Moon	0.57	34.13	1.3	6.3	D	398	125
3 - NB Coleraine	0.16	2.52	0.2	0.5	A	255	255
4 - WB King St	0.54	6.64	1.2	1.5	A	1038	587

## Main Results for each time segment

### 08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	411	543	1883	0.530	997	109	0.7	1.1	4.057	A
2 - EB Harvest Moon	358	112	28	259	0	1474	428	0.262	111	66	0.2	0.3	11.366	B
3 - NB Coleraine	229	229	57	0	259	507	1790	0.128	229	1078	0.1	0.1	2.305	A
4 - WB King St	933	527	132	411	0	126	1207	0.437	526	610	0.6	0.8	5.285	A

### 08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	504	665	1791	0.683	1219	133	1.1	2.1	6.250	A
2 - EB Harvest Moon	439	137	34	317	0	1803	245	0.561	134	81	0.3	1.2	31.597	D
3 - NB Coleraine	280	280	70	0	317	617	1712	0.164	280	1319	0.1	0.2	2.514	A
4 - WB King St	1143	646	161	504	0	154	1188	0.544	644	744	0.8	1.2	6.599	A

### 08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	1223	1223	306	0	504	666	1790	0.683	1223	133	2.1	2.1	6.348	A
2 - EB Harvest Moon	439	137	34	317	0	1808	242	0.567	137	81	1.2	1.3	34.131	D
3 - NB Coleraine	280	280	70	0	317	622	1708	0.164	280	1323	0.2	0.2	2.520	A
4 - WB King St	1143	646	161	504	0	154	1188	0.544	646	748	1.2	1.2	6.639	A

### 08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	999	999	250	0	411	546	1881	0.531	1002	109	2.1	1.1	4.115	A
2 - EB Harvest Moon	358	112	28	259	0	1482	423	0.265	116	67	1.3	0.4	11.828	B
3 - NB Coleraine	229	229	57	0	259	513	1785	0.128	229	1084	0.2	0.1	2.312	A
4 - WB King St	933	527	132	411	0	126	1207	0.437	529	616	1.2	0.8	5.325	A

## Queue Variation Results for each time segment

### 08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	1.12	0.05	0.62	2.50	3.62			N/A	N/A
2 - EB Harvest Moon	0.35	0.00	0.00	0.35	0.35			N/A	N/A
3 - NB Coleraine	0.15	0.00	0.00	0.15	0.15			N/A	N/A
4 - WB King St	0.77	0.11	0.87	1.41	1.48			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	2.11	0.03	0.27	2.11	2.11			N/A	N/A
2 - EB Harvest Moon	1.18	0.03	0.28	1.18	4.34			N/A	N/A
3 - NB Coleraine	0.20	0.03	0.25	0.46	0.48			N/A	N/A
4 - WB King St	1.17	0.03	0.26	1.17	1.17			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	2.13	0.03	0.27	2.13	2.13			N/A	N/A
2 - EB Harvest Moon	1.25	0.03	0.34	2.90	6.33			N/A	N/A
3 - NB Coleraine	0.20	0.03	0.25	0.45	0.48			N/A	N/A
4 - WB King St	1.18	0.03	0.27	1.18	1.27			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	1.14	0.12	1.04	1.83	2.34			N/A	N/A
2 - EB Harvest Moon	0.37	0.03	0.33	1.09	1.30			N/A	N/A
3 - NB Coleraine	0.15	0.00	0.00	0.15	0.15			N/A	N/A
4 - WB King St	0.78	0.18	0.93	1.40	1.46			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			100.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	100.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			100.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	100.00

## C-100 - 2041 Grade Separated, PM

### Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Sets	D4 - 2041 Grade Separated, PM	Time results are shown for central hour only. (Model is run for a 90 minute period.)
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

### Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	C-100	✓	100.000	100.000

## Intersection Network

## Intersections

Intersection	Name	Intersection Type	Leg order	Intersection Delay (s)	Intersection LOS
1	Intersection 1	Standard Roundabout	1,2,3,4	3.51	A

## Intersection Network Options

Driving side	Lighting	Network residual capacity (%)	First leg reaching threshold
Right	Normal/unknown	92	1 - SB Emil Kolb

## Legs

### Legs

Leg	Name	Description
1	SB Emil Kolb	
2	EB Harvest Moon	
3	NB Coleraine	
4	WB King St	

## Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0	
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0	
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0	
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0	

## Bypass

Leg	Leg has bypass	Bypass utilisation (%)
1 - SB Emil Kolb		
2 - EB Harvest Moon	✓	100
3 - NB Coleraine		
4 - WB King St	✓	100

## Slope / Intercept / Capacity

### Leg Intercept Adjustments

Leg	Type	Reason	Percentage intercept adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00

### Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - SB Emil Kolb	0.797	2492
2 - EB Harvest Moon	0.565	1353
3 - NB Coleraine	0.797	2492
4 - WB King St	0.556	1332

The slope and intercept shown above include any corrections and adjustments.

### Leg Capacity Adjustments

Leg	Type	Reason	Percentage capacity adjustment (%)
1 - SB Emil Kolb	Percentage		100.00
2 - EB Harvest Moon	Percentage		100.00
3 - NB Coleraine	Percentage		100.00
4 - WB King St	Percentage		100.00



# Traffic Demand

## Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Results for central hour only	Run automatically
D4	2041 Grade Separated	PM	ONE HOUR	07:45	09:15	15	✓	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCE Factor for a Truck (PCE)
✓	✓	Truck Percentages	2.00

## Demand overview (Traffic)

Leg	Linked leg	Profile type	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - SB Emil Kolb		ONE HOUR	✓	709	89.000
2 - EB Harvest Moon		ONE HOUR	✓	253	89.000
3 - NB Coleraine		ONE HOUR	✓	591	89.000
4 - WB King St		ONE HOUR	✓	394	89.000

## Origin-Destination Data

### Demand (Veh/hr)

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	9	174	526
	2 - EB Harvest Moon	0	0	132	121
	3 - NB Coleraine	0	247	0	344
	4 - WB King St	0	210	184	0

## Vehicle Mix

### Truck Percentages

		To			
		1 - SB Emil Kolb	2 - EB Harvest Moon	3 - NB Coleraine	4 - WB King St
From	1 - SB Emil Kolb	0	2	23	1
	2 - EB Harvest Moon	0	2	2	2
	3 - NB Coleraine	0	2	2	1
	4 - WB King St	0	2	2	2

## Results

### Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Intersection Arrivals (Veh)
1 - SB Emil Kolb	0.37	3.08	0.6	2.8	A	631	631
2 - EB Harvest Moon	0.14	5.13	0.2	0.5	A	225	108
3 - NB Coleraine	0.30	2.62	0.4	1.5	A	526	526
4 - WB King St	0.33	4.58	0.5	2.2	A	351	351

## Main Results for each time segment

### 08:00 - 08:15

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	0	512	1950	0.291	567	0	0.3	0.4	2.602	A
2 - EB Harvest Moon	202	97	24	106	0	707	914	0.106	97	373	0.1	0.1	4.407	A
3 - NB Coleraine	473	473	118	0	106	517	2046	0.231	473	286	0.2	0.3	2.288	A
4 - WB King St	315	315	79	0	0	198	1196	0.263	315	792	0.3	0.4	4.083	A

### 08:15 - 08:30

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	0	627	1862	0.373	694	0	0.4	0.6	3.080	A
2 - EB Harvest Moon	248	119	30	129	0	865	821	0.144	118	456	0.1	0.2	5.123	A
3 - NB Coleraine	579	579	145	0	129	633	1953	0.296	579	350	0.3	0.4	2.619	A
4 - WB King St	386	386	97	0	0	242	1172	0.330	386	970	0.4	0.5	4.576	A

### 08:30 - 08:45

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	695	695	174	0	0	628	1862	0.373	695	0	0.6	0.6	3.083	A
2 - EB Harvest Moon	248	119	30	129	0	866	820	0.145	119	457	0.2	0.2	5.129	A
3 - NB Coleraine	579	579	145	0	129	634	1953	0.297	579	351	0.4	0.4	2.620	A
4 - WB King St	386	386	97	0	0	242	1172	0.330	386	971	0.5	0.5	4.582	A

### 08:45 - 09:00

Leg	Total Demand (Veh/hr)	Intersection demand (Veh/hr)	Intersection Arrivals (Veh)	Bypass demand (Veh/hr)	Bypass exit flow (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	Throughput (exit side) (Veh/hr)	Start queue (Veh)	End queue (Veh)	Delay (s)	LOS
1 - SB Emil Kolb	567	567	142	0	0	514	1949	0.291	568	0	0.6	0.4	2.607	A
2 - EB Harvest Moon	202	97	24	106	0	708	913	0.106	97	373	0.2	0.1	4.414	A
3 - NB Coleraine	473	473	118	0	106	518	2045	0.231	473	287	0.4	0.3	2.293	A
4 - WB King St	315	315	79	0	0	198	1196	0.264	316	794	0.5	0.4	4.090	A

## Queue Variation Results for each time segment

### 08:00 - 08:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.41	0.00	0.00	0.41	0.41			N/A	N/A
2 - EB Harvest Moon	0.12	0.00	0.00	0.12	0.12			N/A	N/A
3 - NB Coleraine	0.30	0.00	0.00	0.30	0.30			N/A	N/A
4 - WB King St	0.36	0.00	0.00	0.36	0.36			N/A	N/A

#### 08:15 - 08:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.59	0.03	0.25	0.59	0.59			N/A	N/A
2 - EB Harvest Moon	0.17	0.03	0.26	0.46	0.49			N/A	N/A
3 - NB Coleraine	0.42	0.03	0.25	0.45	0.48			N/A	N/A
4 - WB King St	0.49	0.03	0.25	0.49	0.49			N/A	N/A

#### 08:30 - 08:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.59	0.03	0.29	1.33	2.77			N/A	N/A
2 - EB Harvest Moon	0.17	0.03	0.25	0.45	0.48			N/A	N/A
3 - NB Coleraine	0.42	0.03	0.33	1.34	1.48			N/A	N/A
4 - WB King St	0.49	0.03	0.30	1.37	2.20			N/A	N/A

#### 08:45 - 09:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - SB Emil Kolb	0.41	0.00	0.00	0.41	0.41			N/A	N/A
2 - EB Harvest Moon	0.12	0.00	0.00	0.12	0.12			N/A	N/A
3 - NB Coleraine	0.30	0.00	0.00	0.30	0.30			N/A	N/A
4 - WB King St	0.36	0.00	0.00	0.36	0.36			N/A	N/A

## Custom A

### Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only	Leg has bypass	Percentage capacity adjustment (%)
1 - SB Emil Kolb	7.40	8.00	20.0	20.0	44.0	20.0			100.00
2 - EB Harvest Moon	4.25	4.25	0.0	30.0	48.0	20.0		✓	100.00
3 - NB Coleraine	7.40	8.00	20.0	20.0	44.0	20.0			100.00
4 - WB King St	4.25	4.25	0.0	20.0	48.0	20.0		✓	100.00