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TRANSPORTATION SOLUTIONS LIMITED

609-635 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir Waterdown, Ontario Transportation Impact Study and TDM Options

Paradigm Transportation Solutions Limited

November 2016

Project Summary

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609-635 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir Waterdown, Ontario Transportation Impact Study and TDM Options

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1	August 2016	SE/PK	For Client Review
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Signatures and Stamps

Signature

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Disclaimer

Executive Summary

Content

Paradigm Transportation Solutions Limited (Paradigm) has been retained by Country Green Homes Inc. to conduct this Transportation Impact Study. The purpose of the study is to determine the potential traffic impact of the development on the surrounding roadway network. Of interest are the following intersections:

- Parkside Drive and Hamilton Street North;
- Parkside Drive and Cole Street;
- Nisbet Boulevard and Hamilton Street North/Centre Road;
- Nisbet Boulevard and Truedell Drive; and
- Nisbet Boulevard and Cole Street.

The scope of the study includes determination of the current traffic and site conditions in the vicinity of the development, additional traffic that will be generated by the development, analyses of the impact of the traffic and development of recommendations on the measures required in order to accommodate this traffic in a satisfactory manner for a five-year planning horizon from full build-out (2023). The AM, and PM peak hours were used for analysis in this report.

The parcel of land to be developed as the subject site is located on the west side of Hamilton Street North, between Parkside Drive and Nisbet Boulevard. The proposed development consists of 63 townhouses.

Access will be provided via connections to the existing roads of Truedell Drive and Truedell Circle, as well as individual driveway connections onto Nisbet Boulevard. Access to the greater road network will be provided via the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road, and the intersection of Parkside Drive and Cole Street. Vehicle parking is provided via individual unit driveways/garages, and 12 spaces will be provided for visitors in addition to on-street parking.

Conclusions

Based on the analyses contained in the report, it is concluded that:

- **under existing conditions** at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.92) during the AM peak hour; and

  - the westbound through-right movement operates at LOS F (v/c = 1.06) during the PM peak hour.

- **under 2023 background conditions** at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.97) during the AM peak hour;
  - the westbound through-right movement operates at LOS F (v/c = 1.01) during the PM peak hour;
  - the northbound left movement operates at LOS F (v/c = 0.97) during the PM peak hour; and
  - the southbound left and through-right movements operate at LOS E (v/c = 0.92 and v/c = 0.97, respectively).
- **under 2023 background conditions** at the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road:
  - the eastbound left movement operates at LOS F (v/c = 0.73 and v/c = 0.49) during the AM and PM peak hour.
- the proposed development is forecast to produce about 27 net new trips during the AM peak hour (5 in and 22 out), and 32 net new trips during the PM peak hour (22 in and 10 out);
- **under 2023 total conditions** at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.97) during the AM peak hour;
  - the westbound through-right movement operates at LOS F (v/c = 1.01) during the PM peak hour;
  - the northbound left movement operates at LOS F (v/c = 0.98) during the PM peak hour; and
  - the southbound left and through-right movements operate at LOS E (v/c = 0.89 and v/c = 0.94, respectively).
- **under 2023 total conditions** at the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road:
  - the eastbound left movement operates at LOS F (v/c = 0.77 and v/c = 0.57) during the AM and PM peak hour.
- traffic control signals would not be warranted at any intersections within the study area under any horizon;
- auxiliary left turn lanes would not be warranted at any intersections within the study area under any horizon;
- right turn volumes on each leg of the intersection of Parkside Drive and Hamilton Street North are in excess of 100 vehicles during either the AM or PM peak hour; and

- with implementation of right turn lanes, the intersection of Parkside Drive and Hamilton Street North will operate at significantly improved levels (average vehicle delay decreases of approximately 10 seconds in AM peak hour and 30 seconds in PM peak hour).

Recommendations

Based on the foregoing, it is recommended that:

- the City of Hamilton recognize the conclusions drawn above; and
- the City of Hamilton consider implementing auxiliary right turn lanes as a result of background traffic at the intersection of Parkside Drive and Hamilton Street North to reduce traffic delays;
- the development be approved for construction with no requirements for off-site transportation network improvements.
- to promote alternative modes and further reduce the dependency on automobile use, the owner and City investigate, evaluate and implement TDM programs and measures as identified.

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1 Introduction

Planning applications have been submitted for a residential development at 609-635 Centre Road and 3 Nisbet Boulevard and 129-137 Truedell Circle in Hamilton (Waterdown), Ontario (**Figure 1.1**).

The parcel of land to be developed as the subject site is located on the west side of Hamilton Street North, between Parkside Drive and Nisbet Boulevard. The proposed development consists of 63 townhouses. Access will be provided via connections to the existing roads of Truedell Drive and Truedell Circle, as well as individual driveway connections onto Nisbet Boulevard.

Access to the greater road network will be provided via the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road, and the intersection of Parkside Drive and Cole Street.

Vehicle parking is provided via individual unit driveways/garages, and 12 spaces will be provided for visitors in addition to on-street parking.

1.1 Purpose and Scope

Paradigm Transportation Solutions Limited (Paradigm) has been retained by Country Green Homes Inc. to conduct this Transportation Impact Study for a planned residential development located in the City of Hamilton (Waterdown). This study has been prepared in accordance with the requirements detailed by the City of Hamilton in its Traffic Impact Study Guidelines[1]. Paradigm contacted the City of Hamilton in accordance with the requirements of the City to hold a pre-study conference meeting to confirm the study scope. City staff indicated that correspondence by e-mail would be sufficient.

The purpose of the study is to determine the impact of the additional development traffic on the surrounding road network and the improvements required to accommodate this future traffic. The scope of the study includes determination of the current traffic and site conditions in the vicinity of the development, estimates of background traffic growth in the area, estimates of the additional traffic that will be generated by the development, analyses of the impact of the traffic and recommendations on the remedial measures necessary to accommodate the future traffic in a satisfactory manner.

Based on the consultation with city staff, the following assumptions guided the development of this report:

[1] Traffic Impact Study Guidelines, City of Hamilton, July, 2009.

- the study area would include the following intersections:
  - Parkside Drive and Hamilton Street North;
  - Parkside Drive and Cole Street;
  - Nisbet Boulevard and Hamilton Street North/Centre Road;
  - Nisbet Boulevard and Truedell Drive; and
  - Nisbet Boulevard and Cole Street.
- It is noted that no development driveways were assessed, as the planned development plans to connect to existing dead-ends, this results in minimal, if any, conflicting traffic. To determine any impacts, Paradigm assessed the aforementioned intersection of Nisbet Boulevard and Truedell Drive.
- the analysis horizon would extend for five years after construction and full occupancy of the development (i.e. 2023, assuming two years for construction), and
- AM and PM peak hours were analyzed to assess traffic operations.

Image Source: Google Earth, date of photo 20/04/2016

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Study Area and Development Location

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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Figure 1.1

2 Existing Conditions

This section documents current traffic conditions, operational deficiencies, and constraints experienced by the public travelling at the intersections within the study area. The operational deficiencies and constraints identified at this stage will be fundamental to the process of defining the required remedial measures.

2.1 Existing Roads, Transit, Cycling and Pedestrian Service

The area primarily comprised of residential developments, with commercial developments to the south.

Parkside Drive is a two lane arterial road which serves as the main east-west route for north Waterdown. Parkside Drive has a posted speed limit of 50 km/h.

Hamilton Street North is a three lane arterial road which serves as the main local north-south route. The street has one travel lane in each direction and a centre two-way left turn lane. Hamilton Street North has a posted speed limit of 50 km/h, and services the main commercial area within Waterdown.

Nisbet Boulevard, Cole Street, and Truedell Drive are all two-lane local roads with speed limits of 50 km/h.

The intersection of Parkside Drive and Hamilton Street North operates under signalized control. The intersection of Nisbet Boulevard and Cole Street is a one-lane local roundabout. All other intersections operate under one-way stop control on the side-street.

Currently there are sidewalks present on both sides of all roads within the study. There are no dedicated cycling facilities within the study area. **Figure 2.1** displays the intersection lane configuration within the study area.

Hamilton Street Rail Company (HSR) currently operates one bus route near the subject site. **Figure 2.2** displays the transit routes' location relative to the subject site. The transit route is described as follows:

- **Route #18 Waterdown**: serves the community of Waterdown via Parkside Drive, Hollybush Drive, Dundas Street, Spring Creek Drive and Waterdown Road, and connects its resident to GO Transit commuter services at the Aldershot GO Station. Service runs on weekdays (5am-9pm) and Saturdays (8am-9pm) with no service on Sundays or holidays.

2.2 Traffic Volumes

The City of Hamilton was contacted to provide turning movement counts where available and dated within a reasonable timeframe (2 years). No traffic counts were available from the City, therefore Paradigm collected their own traffic data utilizing Miovision Scout traffic recorders, for intersections within the study area.

Total two-way peak hour traffic volumes on Parkside Drive near the site are approximately 1,030 vehicles during the AM peak hour, and 1,260 vehicles during the PM peak hour. These volumes are considered to be well within the maximum accepted capacity for a two-lane arterial street (1,800).

Total two-way peak hour traffic volumes on Hamilton Street North near the site are approximately 1,120 vehicles during the AM peak hour, and 1,110 vehicles during the PM peak hour. These volumes are considered to be well within the maximum accepted capacity for a two-lane arterial street (1,800).

Figure 2.2a and **Figure 2.2b** display the existing AM and PM peak hour traffic volumes, respectively.

It is noted that for the intersection of Nisbet Boulevard and Truedell Drive traffic counts were not collected. Paradigm utilized the traffic counts at adjacent intersections in order to estimate the turning volumes. Paradigm did not assume that any traffic turned into dwelling driveways between the two streets, but rather all “lost traffic” was assigned to Truedell Drive. This represents a more conservative approach.

Appendix A contains the detailed traffic counts.

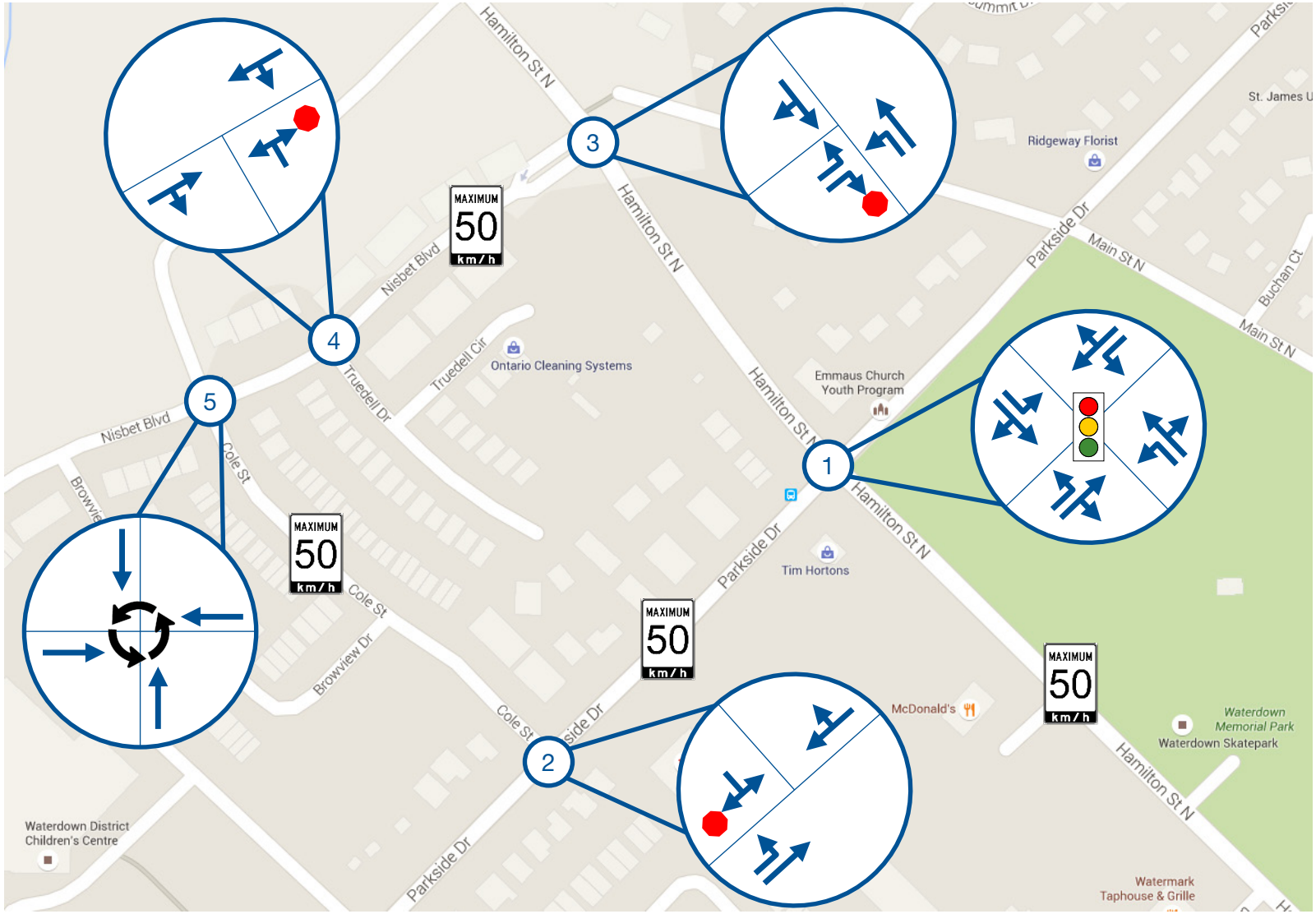

Image Source: Google Maps

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Existing Lane Configuration and Traffic Control

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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Figure 2.1

Existing Transit Routes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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Figure 2.2

2.3 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the delays to traffic flow at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles desiring to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on a number of criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections or 50 seconds for unsignalized intersections, the movement is classed as LOS F and remedial measures are usually implemented, if they are feasible.

The intersection analysis considered two separate measures of performance:

- the volume to capacity ratio for each intersection; and
- the level of service (LOS) for each turning movement which is based on the average control delay per vehicle.

The operation of the intersections within the study area was evaluated using Synchro v9 with the existing turning movement volumes. **Table 2.2** summarizes the operations. The following was noted:

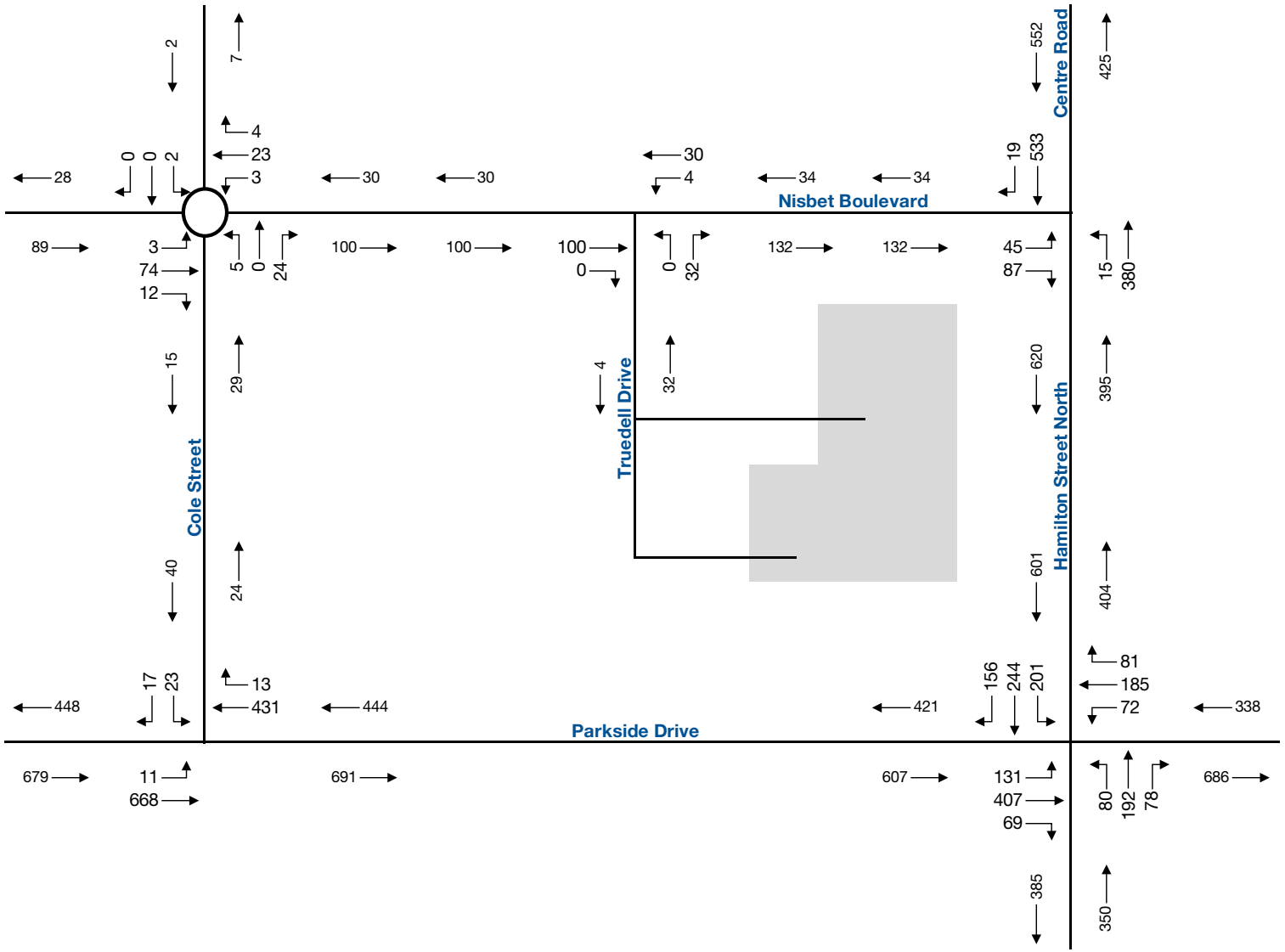
- at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.92) during the AM peak hour; and
  - the westbound through-right movement operates at LOS F (v/c = 1.06) during the PM peak hour.
- all other movements operate at LOS D or better.

Appendix B provides the detailed Synchro v9 outputs for the existing traffic operations.

TABLE 2.2: 2016 EXISTING PEAK HOUR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				
				LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	OVERALL
AM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	C	E	E	**D**	C	D	D	**D**	C	C	C	**C**	B	C	C	**C**	**D**
			Delay	26	61	61	**54**	33	40	40	**38**	20	29	29	**27**	19	32	32	**28**	**40**
			V/C	0.40	0.92	0.92		0.45	0.58	0.58		0.23	0.42	0.42		0.44	0.61	0.61		
			Queue	35	194	194		21	88	88		21	83	83		48	130	130		
	2 - Parkside Drive and Cole Street	TWSC	LOS	A	A		**A**		A	A	**A**					B		B	**B**	**1**
			Delay	8	0		**0**		0	0	**0**					14		14	**14**	
			V/C	0.01	0.43				0.28	0.28						0.09		0.09		
			Queue	0	0				0	0						3		3		
	3 - Nisbet Boulevard and Hamilton Street North/Centre Road	TWSC	LOS	C		B	**C**					A	A		**A**		A	A	**A**	**2**
			Delay	23		14	**17**					9	0		**0**		0	0	**0**	
			V/C	0.20		0.19						0.02	0.24				0.35	0.35		
			Queue	6		6						0	0				0	0		
	4 - Nisbet Boulevard and Truedell Drive	TWSC	LOS		A	A	**A**	A	A		**A**	A		A	**A**					**2**
			Delay		0	0	**0**	1	1		**1**	9		9	**9**					
			V/C		0.06	0.06		0.00	0.00			0.04		0.04						
			Queue		0	0		0	0			1		1						
	5 - Nisbet Boulevard and Cole Street	Round-about	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**3**				**3**				**3**				**0**	**3**
			V/C				**0.08**				**0.03**				**0.03**				**0.00**	
			Queue				**1**				**1**				**1**				**0**	
PM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	D	D	D	**D**	D	F	F	**F**	C	D	D	**D**	C	D	D	**D**	**D**
			Delay	36	47	47	**44**	47	97	97	**83**	24	38	38	**35**	23	40	40	**36**	**53**
			V/C	0.65	0.79	0.79		0.85	1.06	1.06		0.46	0.66	0.66		0.43	0.70	0.70		
			Queue	39	149	149		73	254	254		34	133	133		33	143	143		
	2 - Parkside Drive and Cole Street	TWSC	LOS	A	A		**A**		A	A	**A**					C		C	**C**	**1**
			Delay	10	0		**0**		0	0	**0**					16		16	**16**	
			V/C	0.03	0.33				0.49	0.49						0.10		0.10		
			Queue	1	0				0	0						3		3		
	3 - Nisbet Boulevard and Hamilton Street North/Centre Road	TWSC	LOS	D		B	**C**					A	A		**A**		A	A	**A**	**1**
			Delay	28		12	**17**					9	0		**1**		0	0	**0**	
			V/C	0.10		0.07						0.05	0.34				0.32	0.32		
			Queue	3		2						1	0				0	0		
	4 - Nisbet Boulevard and Truedell Drive	TWSC	LOS		A	A	**A**	A	A		**A**	A		A	**A**					**1**
			Delay		0	0	**0**	2	2		**2**	9		9	**9**					
			V/C		0.03	0.03		0.01	0.01			0.00		0.00						
			Queue		0	0		0	0			0		0						
	5 - Nisbet Boulevard and Cole Street	Round-about	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**3**				**3**				**3**				**3**	**3**
			V/C				**0.05**				**0.04**				**0.03**				**0.01**	
			Queue				**1**				**1**				**1**				**1**	

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Queue - 95th Percentile Queue Length (metres)
TWSC - Two-Way Stop Control



2016 Existing AM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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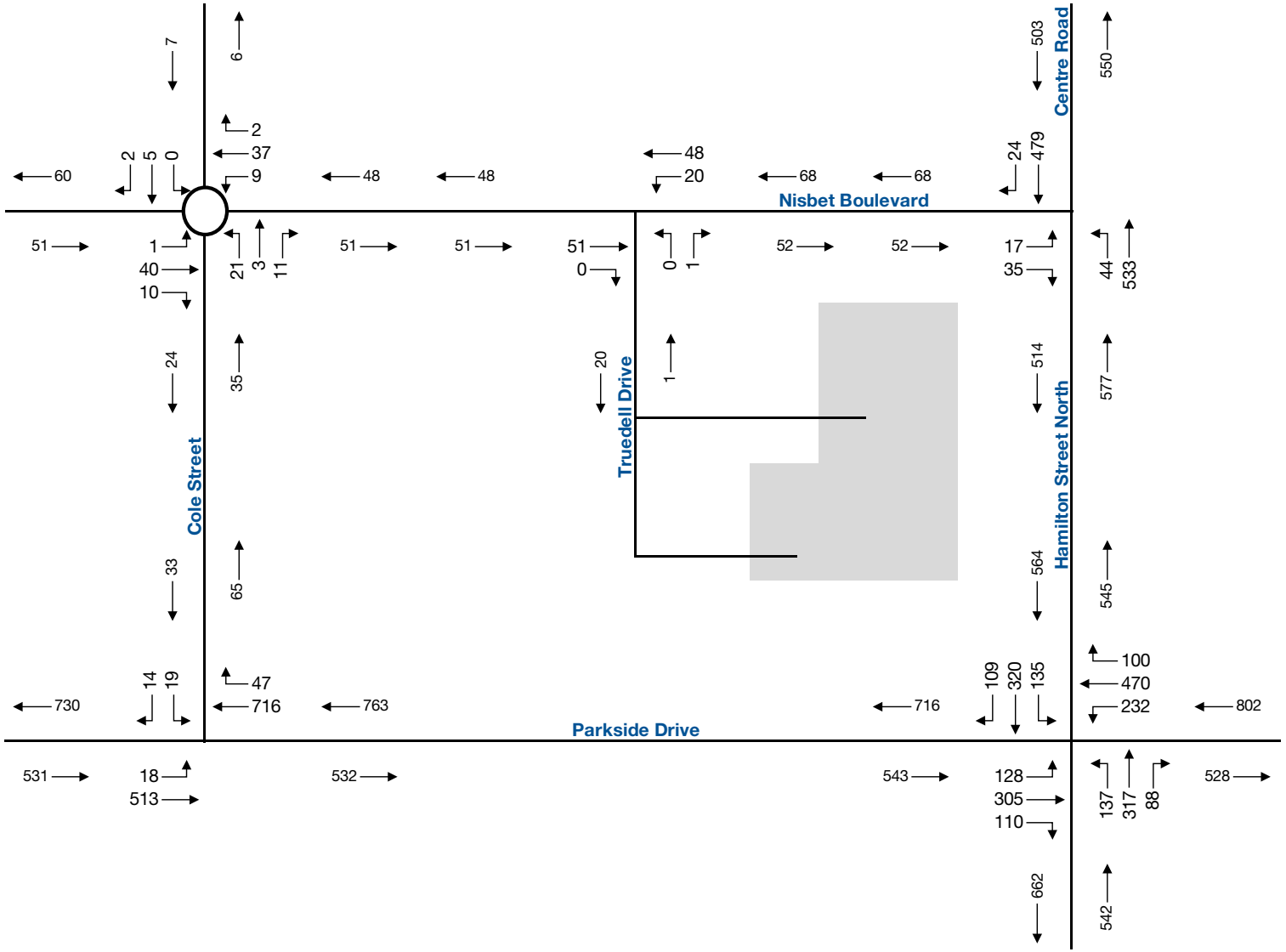
Figure 2.2a



2016 Existing PM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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Figure 2.2b

3 Development Concept

The parcel of land to be developed as the subject site is located on the west side of Hamilton Street North, between Parkside Drive and Nisbet Boulevard. The proposed development consists of 63 townhouses.

Access will be provided via connection into the existing roads of Truedell Drive and Truedell Circle, as well as individual driveway connections onto Nisbet Boulevard. Access to the greater road network will be provided via the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road, and the intersection of Parkside Drive and Cole Street.

Vehicle parking is provided via individual unit driveways/garages, and 12 spaces will be provided for visitors in addition to on-street parking.

Truedell Drive and Truedell Circle have a pavement width of 8.50 meters. With on-street parking permitted on at least one-side of these roadways, the effective travel lane is essentially reduced to 6.00 metres that is consistent with the development's internal condominium roadway.

To maintain a travel lane width of 6.00 metres within the development, parking restrictions along both sides of the internal roadway should be provided with the exception to designated lay-by areas. Implementing these parking restrictions will provide for a seamless transition between the municipal roadway and the internal condominium roadway.

Figure 3.1 displays the proposed site plan.

3.1 Development Trip Generation

For the purposes of forecasting traffic demand that is likely be generated by the proposed development, the number of residential units and the size of commercial floor space was used with the Institute of Transportation Engineer's Trip Generation[2] Land Use Codes (LUC). The following LUC was used:

- **LUC 230 (Residential Condominium / Townhouse)**: Ownership units that have at least one other owned unit within the same building structure. Both condominiums and townhouses are included in this land use. The studies in this land uses did not identify whether the condos/towns were low-rise or high-rise.

Therefore, as summarized in **Table 3.1** it is estimated that the number of net new trips generated by the proposed development are; 27 AM peak hour trips (5 in and 22 out), and 32 PM peak hour trips (21 in and 12 out).

[2] Trip Generation Ninth Edition, Institute of Transportation Engineers, Washington D.C., 2012

TABLE 3.1: DEVELOPMENT TRIP GENERATION

Land Use Code	Units	AM Peak Hour				PM Peak Hour			
		Rate	Total	In	Out	Rate	Total	In	Out
230 Residential Condominium/Townhouse	63	0.44	27	5	22	0.52	32	21	12

No trip reductions (transit use) were assumed to apply this site, based upon the minimal transit available.

3.2 Development Trip Distribution and Assignment

Given that the surrounding area is of a similar land use (residential), the trip distribution was based on the existing traffic count distributions at studied intersections. **Table 3.2** displays the breakdown of trip distribution used in this study.

TABLE 3.2: TRIP DISTRIBUTION

Origin/Destination	Percentage
East via Parkside Drive	15%
West via Parkside Drive	15%
North via Centre Road	20%
South via Hamilton Street N	50%

Figure 3.2a and **Figure 3.2b** illustrate the site generated traffic volumes and how they were assigned to the road network for the AM and PM peak hours.

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Proposed Site Plan

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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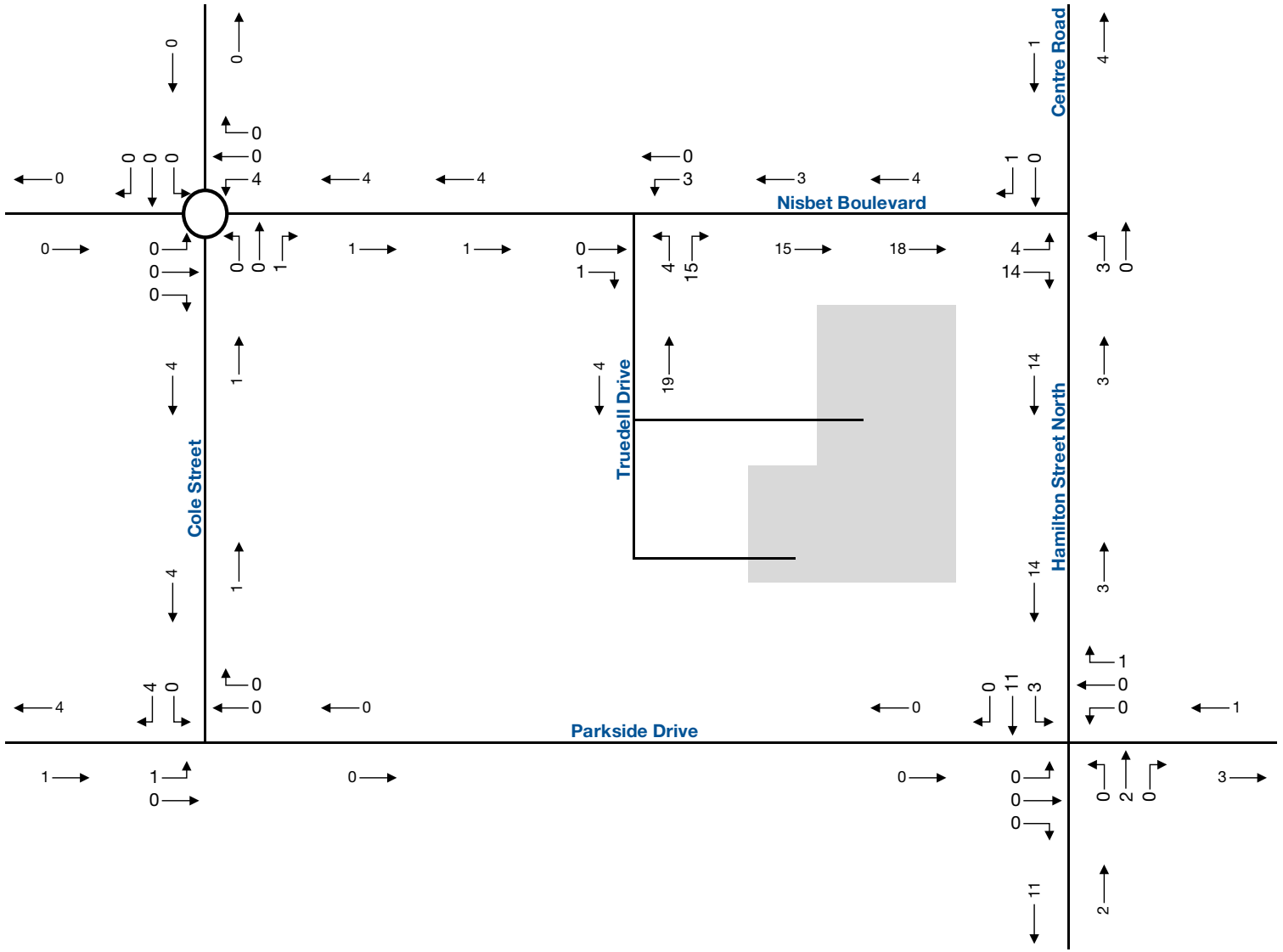
Figure 3.1



Site Generated AM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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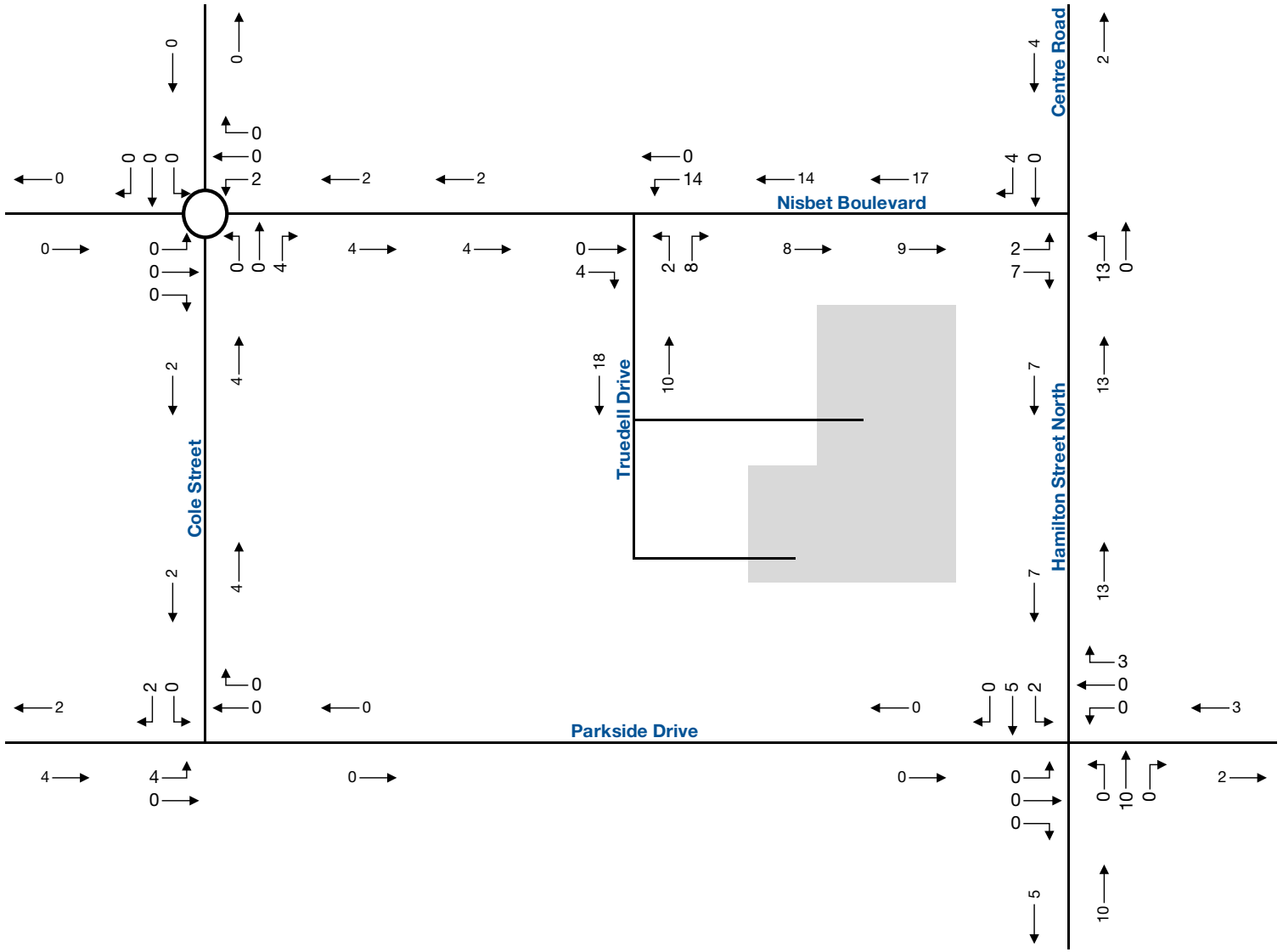
Figure 3.2a



Site Generated PM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
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Figure 3.2b

4 Evaluation of Future Traffic Conditions

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic and analysis for a five year planning horizon, in order to adequately identify the impacts of the development. The likely future traffic volumes in the vicinity of the development will likely consist of increased non-site traffic volumes (background traffic) and the traffic generated by the proposed development (site traffic).

4.1 2023 Background Traffic Growth

4.1.1 Generalized Traffic Growth

The non-site traffic increase is generalized traffic growth in the City of Hamilton, specifically Waterdown. The generalized growth is anticipated to follow the average increase in population within the area. A growth rate of 2% per annum was used for the forecast background traffic.

4.1.2 Other Area Developments

Waterdown is currently experiencing a lot of growth and development. In the area bound by Highway 6 to the west, Hamilton Street North to the east, Parkside Drive to the south and a new proposed east-west street to the north, approximately 2,000 new homes are anticipated in the Waterdown North area.

Utilizing April 2016 aerial photography, Paradigm estimated approximately 750 homes have been constructed within this area. With the subject development adding another 63 units, it can be estimated that another 1200 homes remain to be constructed. Utilizing the ITE land use codes for single family dwellings, this accounts for approximately 900 AM peak hour trips and 1200 PM peak hour trips. It is noted that Paradigm requested information from the City regarding specific development applications in May 2016, however the City did not respond to our request. Therefore, traffic growth in the same neighbourhood was assumed based on amount of available lands, likely development plans and engineering judgement. Paradigm determined that roughly twice the amount of existing traffic in the neighbourhood could be expected by additional development north of Nisbet Boulevard. This was then applied to the road network using the same trip distribution estimates show in **Table 3.2**. This approach is conservative in nature as it does not account for any additional road connections to be made to Centre Road, which would be likely given additional development.

This additional development is forecast to largely utilize the new east-west road north of Parkside Drive. In earlier studies performed for developments within Waterdown North, it has been assumed that 70% of the traffic will be utilizing the new east-west road, and the connection to Highway 6. Therefore, it can be anticipated that the remaining 30% of trips will utilize

Parkside Drive and Hamilton Street North. Assuming an even distribution, Paradigm estimated the additional through volumes along these streets and added to the background traffic.

Additionally, existing traffic volumes are anticipated to be redistributed to the new road. In a memorandum prepared by Dillon Consulting, it was estimated that approximately 40% of the existing traffic on Parkside Drive would be redistributed to the new east-west route further north.

Considering the other developments, general growth and the new road connection, Paradigm forecast AM and PM peak hour background traffic volumes for the 2023 horizon. **Figure 4.1a** and **Figure 4.1b** display the 2023 background traffic volumes for the AM and PM peak hours.

Appendix C contains the background traffic growth and reassignment volume estimates.

It is noted that the traffic volume adjustments are estimates based off of available data and are not a detailed calculation and assignment, as that would be outside of the scope of this study. Traffic impacts for the additional 1200 houses (approximately) to be built should be identified within the respective Transportation Impact Studies for those developments.

4.2 2023 Background Traffic Operations

Based on the forecast 2023 background traffic volumes, LOS analyses have been conducted using Synchro v9 to determine the AM and PM peak hour conditions for the intersection within the study area. It is noted that no improvements to the road network were assumed for the background conditions, aside from the optimization of intersection signal timing plans. **Table 4.1** summarizes the 2023 background traffic operations. Based on the analysis, by 2023 with background traffic, the following is noted:

- at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.97) during the AM peak hour;
  - the westbound through-right movement operates at LOS F (v/c = 1.01) during the PM peak hour;
  - the northbound left movement operates at LOS F (v/c = 0.97) during the PM peak hour; and
  - the southbound left and through-right movements operate at LOS E (v/c = 0.92 and v/c = 0.97, respectively).
- at the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road:
  - the eastbound left movement operates at LOS F (v/c = 0.73 and v/c = 0.49) during the AM and PM peak hour.

- all other movements operate at LOS D or better.

Appendix D provides the detailed Synchro v9 outputs for the 2023 background traffic operations.

4.3 2023 Total Traffic Operations

Figure 4.2a and **Figure 4.2b** display the total traffic expected in 2023, which is the addition of the development traffic to the background traffic, for the AM and PM peak hours.

Based on the forecast 2023 total traffic volumes and optimized signal timing plans, LOS analyses have been conducted using Synchro v9 and the AM and PM peak hour conditions for the study area. **Table 4.3** summarizes the 2023 LOS conditions. Based on the analysis, by 2023 with full development and occupancy of the site, the following is noted:

- at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.97) during the AM peak hour;
  - the westbound through-right movement operates at LOS F (v/c = 1.01) during the PM peak hour;
  - the northbound left movement operates at LOS F (v/c = 0.98) during the PM peak hour; and
  - the southbound left and through-right movements operate at LOS E (v/c = 0.89 and v/c = 0.94, respectively).
- at the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road:
  - the eastbound left movement operates at LOS F (v/c = 0.77 and v/c = 0.57) during the AM and PM peak hour.
- all other movements operate at LOS D or better.

Appendix E provides the detailed Synchro v9 outputs for the 2023 total traffic operations.

TABLE 4.1: 2023 BACKGROUND PEAK HOUR TRAFFIC OPERATIONS

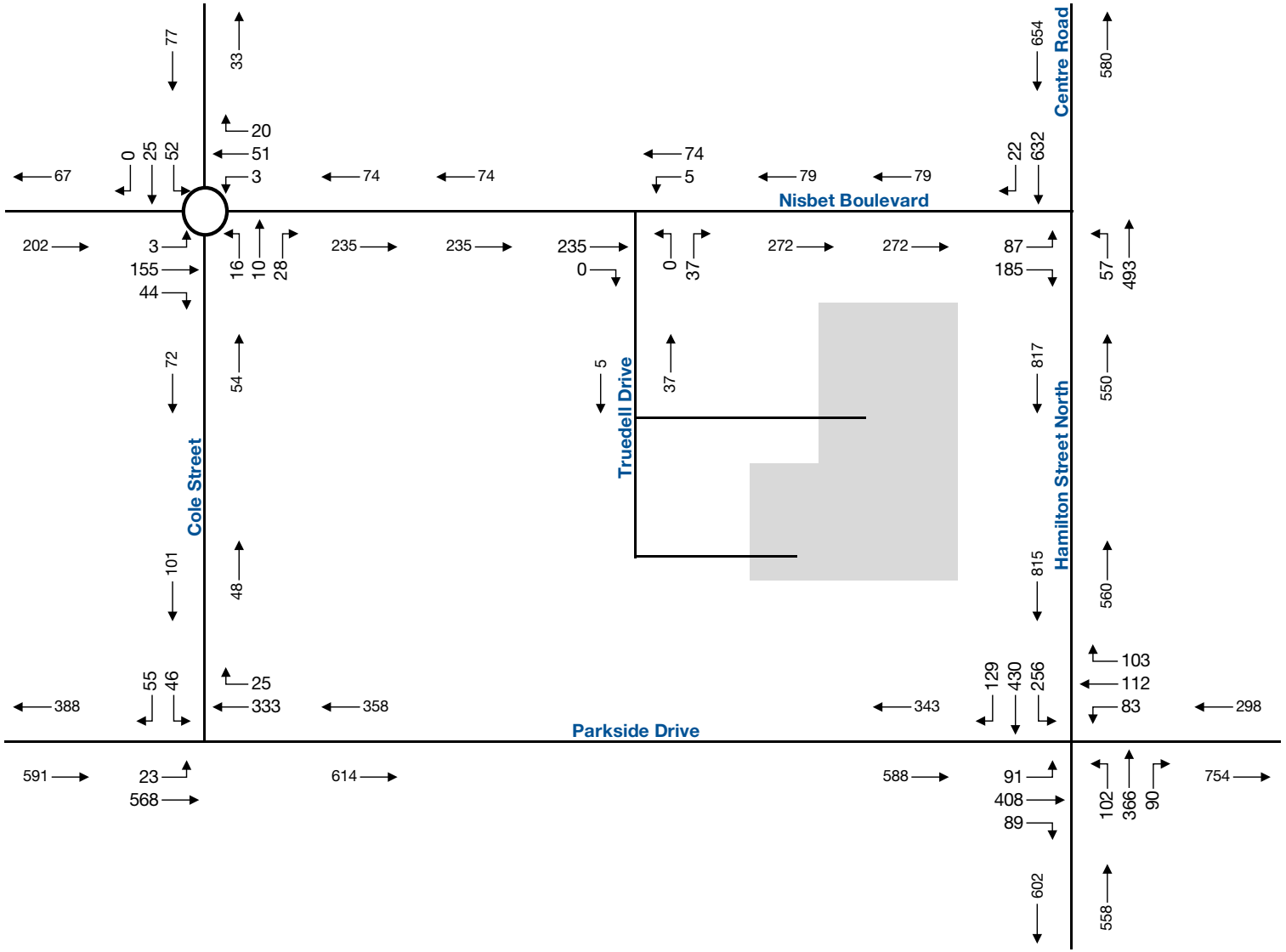
Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				
				LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	OVERALL
AM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	C	E	E	**D**	C	C	C	**C**	C	D	D	**C**	D	D	D	**D**	**D**
			Delay	20	60	60	**54**	28	25	25	**26**	22	36	36	**33**	40	37	37	**38**	**39**
			V/C	0.27	0.97	0.97		0.58	0.39	0.39		0.53	0.79	0.79		0.87	0.85	0.85		
			Queue	21	161	161		19	47	47		20	131	131		67	168	168		
	2 - Parkside Drive and Cole Street	TWSC	LOS	A	A		**A**		A	A	**A**					B		B	**B**	**2**
			Delay	8	0		**0**		0	0	**0**					14		14	**14**	
			V/C	0.02	0.36				0.23	0.23						0.21		0.21		
			Queue	1	0				0	0						6		6		
	3 - Nisbet Boulevard and Hamilton Street North/Centre Road	TWSC	LOS	F		C	**E**					A	A		**A**		A	A	**A**	**8**
			Delay	85		20	**41**					9	0		**1**		0	0	**0**	
			V/C	0.73		0.46						0.07	0.32				0.42	0.42		
			Queue	33		19						2	0				0	0		
	4 - Nisbet Boulevard and Truedell Drive	TWSC	LOS		A	A	**A**	A	A		**A**	A		A	**A**					**1**
			Delay		0	0	**0**	1	1		**1**	10		10	**10**					
			V/C		0.15	0.15		0.00	0.00			0.05		0.05						
			Queue		0	0		0	0			1		1						
	5 - Nisbet Boulevard and Cole Street	Round-about	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**4**				**3**				**3**				**3**	**4**
			V/C				**0.19**				**0.07**				**0.05**				**0.07**	
			Queue				**2**				**1**				**1**				**1**	
PM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	D	D	D	**D**	D	E	E	**E**	F	D	D	**E**	E	E	E	**E**	**E**
			Delay	38	46	46	**45**	43	71	71	**62**	80	49	49	**57**	59	65	65	**66**	**59**
			V/C	0.64	0.82	0.82		0.86	1.01	1.01		0.97	0.88	0.88		0.92	0.97	0.97		
			Queue	12	90	90		40	152	152		29	119	119		24	133	133		
	2 - Parkside Drive and Cole Street	TWSC	LOS	B	A		**A**		A	A	**A**					C		C	**C**	**1**
			Delay	11	0		**1**		0	0	**0**					18		18	**18**	
			V/C	0.08	0.30				0.50	0.50						0.23		0.23		
			Queue	2	0				0	0						7		7		
	3 - Nisbet Boulevard and Hamilton Street North/Centre Road	TWSC	LOS	F		C	**E**					A	A		**A**		A	A	**A**	**4**
			Delay	80		15	**35**					10	0		**1**		0	0	**0**	
			V/C	0.49		0.21						0.12	0.38				0.41	0.41		
			Queue	17		6						3	0				0	0		
	4 - Nisbet Boulevard and Truedell Drive	TWSC	LOS		A	A	**A**	A	A		**A**	A		A	**A**					**1**
			Delay		0	0	**0**	1	1		**1**	9		9	**9**					
			V/C		0.08	0.08		0.02	0.02			0.00		0.00						
			Queue		0	0		0	0			0		0						
	5 - Nisbet Boulevard and Cole Street	Round-about	LOS				**A**				**A**				**A**				**A**	**A**
			Delay				**3**				**3**				**3**				**3**	**3**
			V/C				**0.11**				**0.12**				**0.09**				**0.06**	
			Queue				**1**				**1**				**1**				**1**	

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Queue - 95th Percentile Queue Length (metres)
TWSC - Two-Way Stop Control

TABLE 4.2: 2023 TOTAL PEAK HOUR TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				
				LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	OVERALL
AM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	C	E	E	**D**	C	C	C	**C**	C	D	D	**D**	D	D	D	**D**	**D**
			Delay	20	60	60	**54**	28	25	25	**26**	23	38	38	**35**	40	38	38	**39**	**40**
			V/C	0.27	0.97	0.97		0.58	0.39	0.39		0.56	0.81	0.81		0.88	0.87	0.87		
			Queue	21	161	161		19	47	47		20	135	135		68	173	173		
	2 - Parkside Drive and Cole Street	TWSC	LOS	A	A		**A**		A	A	**A**					B		B	**B**	
			Delay	8	0		**0**		0	0	**0**					14		14	**14**	**2**
			V/C	0.02	0.36				0.23	0.23						0.21		0.21		
			Queue	1	0				0	0						6		6		
	3 - Nisbet Boulevard and Hamilton Street North/Centre Road	TWSC	LOS	F		C	**E**					A	A		**A**		A	A	**A**	
			Delay	93		21	**44**					9	0		**1**		0	0	**0**	**9**
			V/C	0.77		0.49						0.07	0.32				0.42	0.42		
			Queue	36		21						2	0				0	0		
	4 - Nisbet Boulevard and Truedell Drive	TWSC	LOS		A	A	**A**	A	A		**A**	A		A	**A**					
			Delay		0	0	**0**	1	1		**1**	10		10	**10**					**2**
			V/C		0.15	0.15		0.01	0.01			0.08		0.08						
			Queue		0	0		0	0			2		2						
	5 - Nisbet Boulevard and Cole Street	Round-about	LOS				**A**				**A**				**A**				**A**	
			Delay				**4**				**3**				**3**				**3**	**A**
			V/C				**0.19**				**0.07**				**0.06**				**0.07**	**4**
			Queue				**2**				**1**				**1**				**1**	
PM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	D	D	D	**D**	D	E	E	**E**	F	D	D	**E**	E	E	E	**E**	**E**
			Delay	47	50	50	**50**	48	74	74	**66**	89	50	50	**60**	63	62	62	**62**	**60**
			V/C	0.70	0.83	0.83		0.88	1.01	1.01		0.98	0.87	0.87		0.89	0.94	0.94		
			Queue	31	154	154		88	250	250		83	198	198		63	220	220		
	2 - Parkside Drive and Cole Street	TWSC	LOS	B	A		**A**		A	A	**A**					C		C	**C**	
			Delay	11	0		**1**		0	0	**0**					18		18	**18**	**2**
			V/C	0.09	0.30				0.50	0.50						0.24		0.24		
			Queue	2	0				0	0						7		7		
	3 - Nisbet Boulevard and Hamilton Street North/Centre Road	TWSC	LOS	F		C	**E**					A	A		**A**		A	A	**A**	
			Delay	96		15	**40**					10	0		**2**		0	0	**0**	**5**
			V/C	0.57		0.23						0.14	0.38				0.41	0.41		
			Queue	20		7						4	0				0	0		
	4 - Nisbet Boulevard and Truedell Drive	TWSC	LOS		A	A	**A**	A	A		**A**	A		A	**A**					
			Delay		0	0	**0**	2	2		**2**	9		9	**9**					**1**
			V/C		0.08	0.08		0.03	0.03			0.01		0.01						
			Queue		0	0		1	1			0		0						
	5 - Nisbet Boulevard and Cole Street	Round-about	LOS				**A**				**A**				**A**				**A**	
			Delay				**3**				**3**				**3**				**3**	**A**
			V/C				**0.11**				**0.13**				**0.10**				**0.06**	**3**
			Queue				**1**				**1**				**1**				**1**	

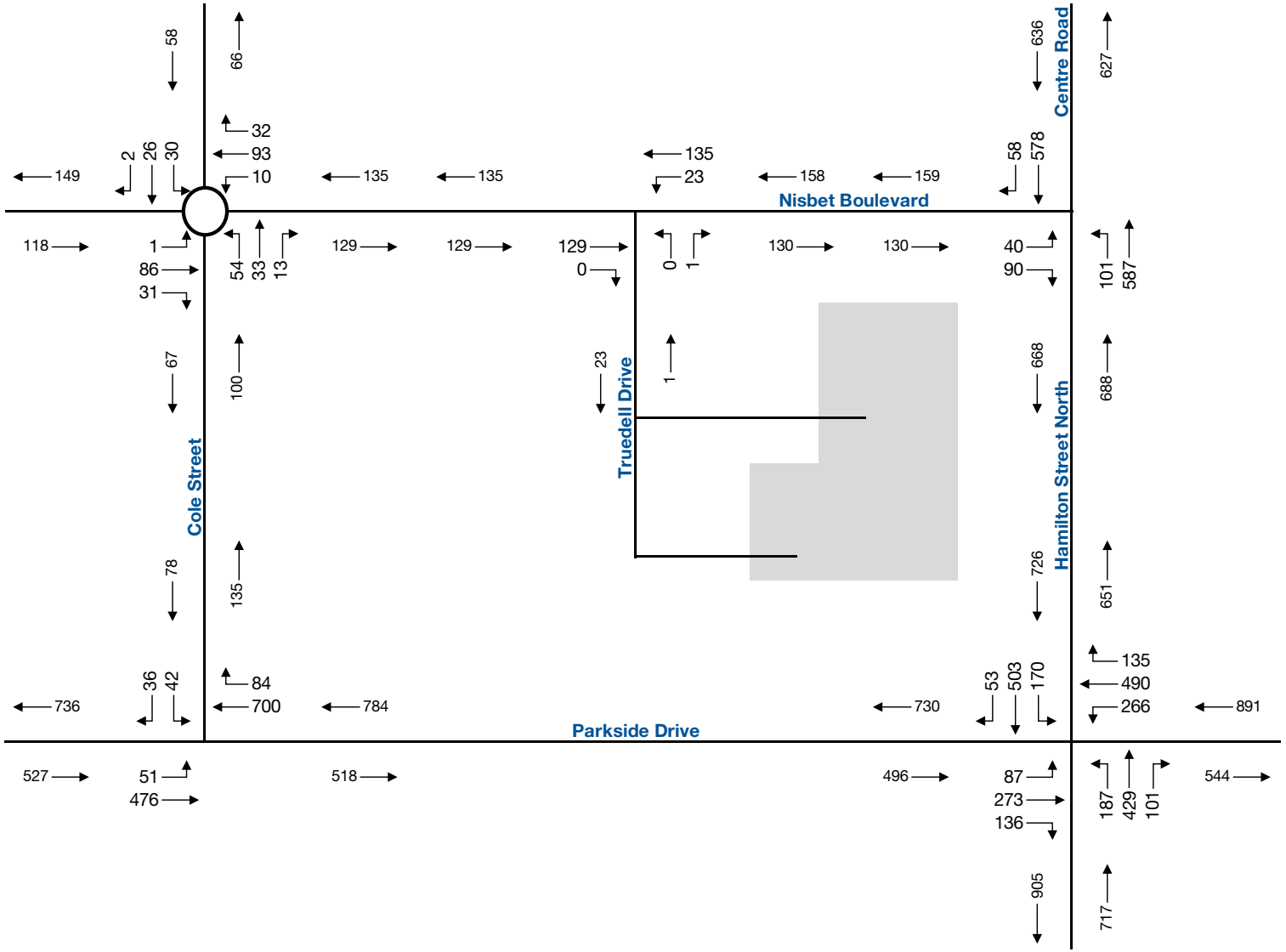
MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Queue - 95th Percentile Queue Length (metres)
TWSC - Two-Way Stop Control



2023 Background AM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
160860

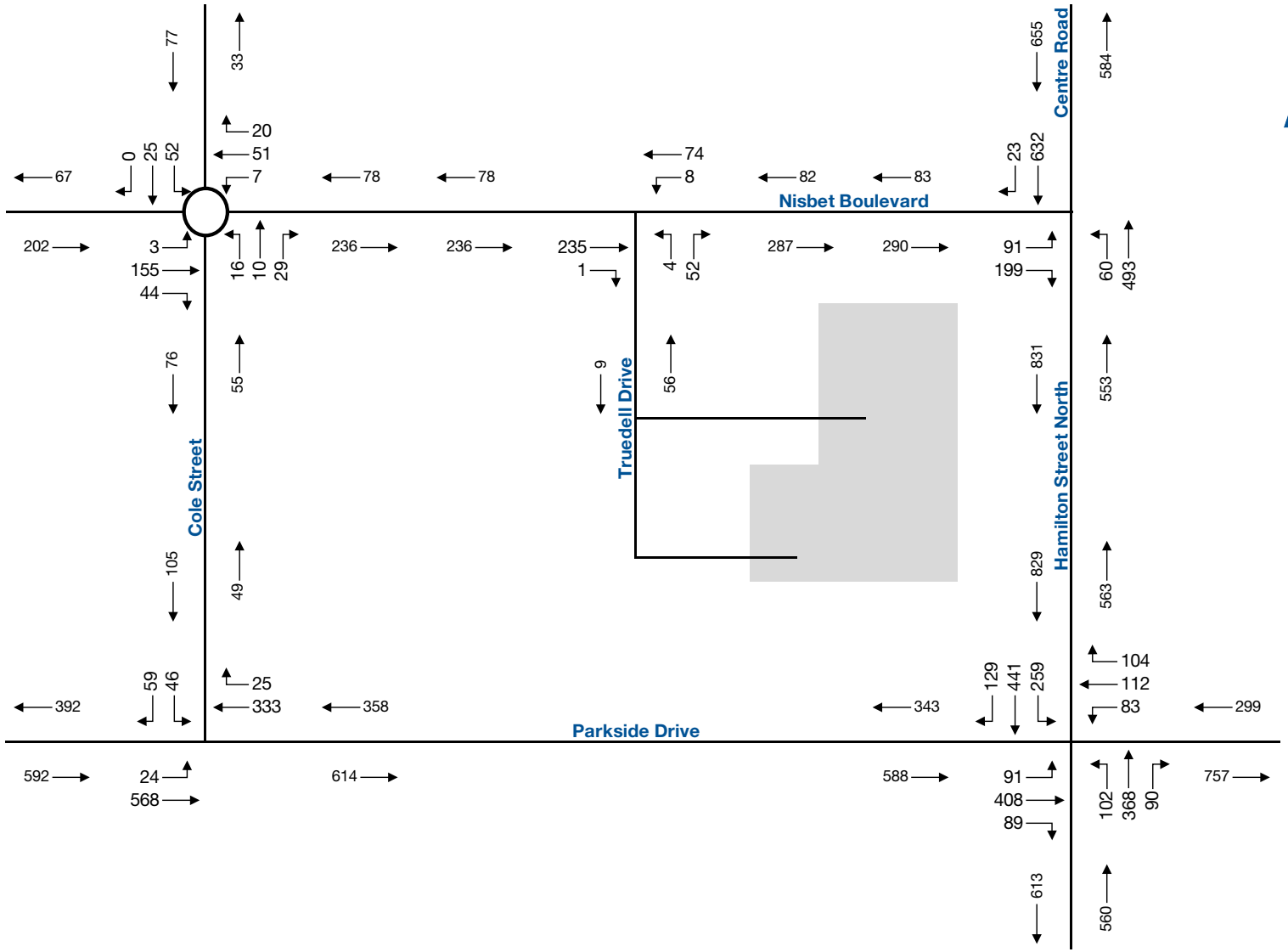
Figure 4.1a



2023 Background PM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
160860

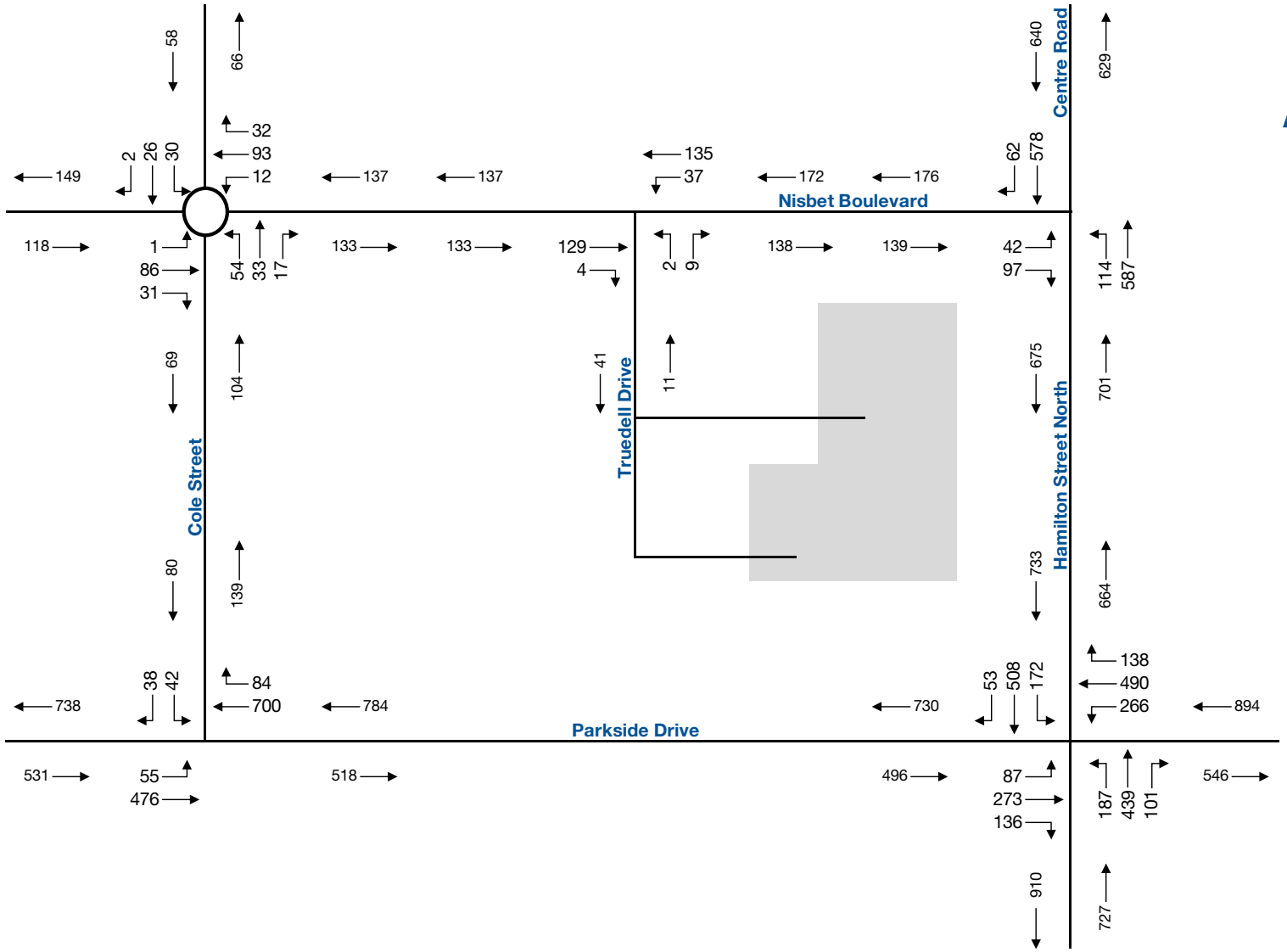
Figure 4.1b



2023 Total AM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
160860

Figure 4.2a



2023 Total PM Peak Hour Traffic Volumes

609-615 Centre Rd, 3 Nisbet Blvd and 129-137 Truedell Cir, Waterdown, TIS
160860

Figure 4.2b

5 Remedial Measures

The following sections review what, if any, measures should be implemented to mitigate the increases in delay resulting from the development of the site.

5.1 Traffic Control Signal Warrant

Paradigm assessed the need for traffic signals at the intersection Parkside Drive and Cole Street and the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road, using the traffic control signal warrant procedures in the Ontario Traffic Manual, Book 12[3].

The warrant analysis determined that no traffic signals would be warranted at either intersection under 2023 Total Traffic conditions, and therefore would not be warranted under any horizon assessed in this study.

Figure 5.1 and **Figure 5.2** display the warrant analysis.

5.2 Auxiliary Turn Lanes

5.2.1 Left Turn Lanes

Currently the only intersection within the study area without an auxiliary left turn lane is the intersection of Nisbet Boulevard and Truedell Drive. Given the overall low traffic volumes at this intersection (< 250 vehicle opposing, < 200 vehicle approaching), Paradigm determined that an auxiliary left turn lane would not be warranted based on the overall low traffic volumes.

5.2.2 Right Turn Lanes

Generally right-turning volumes need to be in excess of 100 vehicles per hour before an exclusive right-turn lane is considered. At the intersection of Parkside Drive and Hamilton Street North each of the respective legs have right turning volumes in excess of 100 vehicles during either the AM or PM peak hour, under both Background and Total Traffic conditions.

Implementation of designated right turn lanes on each leg should be considered by the City as a result of the Background traffic volumes.

5.3 Overall Intersection Operations

5.3.1 Parkside Drive and Hamilton Street North

The intersection of Parkside Drive and Hamilton Street North operates with deficiencies under every horizon assessed. It is noted that the increase in delays and decreased performance between the Background conditions and Total conditions is marginal. For this reason, it can be determined that the

[3] Ontario Traffic Manual Book 12, March 2000

Background Traffic is the main driving force behind the poor operations at the intersection.

In order to improve traffic operations, Paradigm assessed the implementation of designated right turn lanes as previously identified in **Section 5.2.1**. The right turn lanes were found to have a significant improvement in the overall operations by allowing more traffic to travel through the intersection unopposed. Signal timing plans were also optimized for cycle and split length after the assumed implementation of the right turn lanes.

Table 5.1 displays the operations for the intersection with right turn lanes with 25 metres storage implemented.

TABLE 5.1: PARKSIDE DRIVE AND HAMILTON STREET NORTH OPERATIONS WITH RIGHT TURN LANES

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				
				LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	LEFT	THROUGH	RIGHT	APPROACH	OVERALL
AM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	B	E	C	**D**	C	C	C	**C**	B	C	B	**B**	C	C	B	**C**	**C**
			Delay	19	55	21	**44**	22	23	21	**22**	14	22	15	**19**	20	23	14	**21**	**27**
			V/C	0.25	0.94	0.07		0.48	0.27	0.08		0.34	0.58	0.06		0.70	0.66	0.11		
			Queue	19	120	7		17	28	10		16	74	6		44	93	12		
PM Peak Hour	1 - Parkside Drive and Hamilton Street North	Signal	LOS	C	C	C	**C**	C	D	C	**D**	C	C	B	**C**	C	D	B	**C**	**C**
			Delay	31	33	26	**31**	29	48	22	**38**	32	29	18	**28**	20	35	18	**30**	**32**
			V/C	0.59	0.64	0.11		0.76	0.91	0.16		0.78	0.68	0.07		0.59	0.80	0.04		
			Queue	19	74	15		55	151	19		48	110	7		32	146	0		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
V/C - Volume to Capacity Ratio
Queue - 95th Percentile Queue Length (metres)
TWSC - Two-Way Stop Control

Appendix F contains the detailed Synchro reports for the remedial operations.

5.3.2 Nisbet Boulevard and Hamilton Street North/Centre Road

Under both Background and Total Traffic conditions the eastbound movement is forecast to operate at LOS F for both AM and PM peak hours. While this delay is triggering LOS F, it can be seen that the v/c ratios remain below 1.0, showing that the movement is not over capacity.

Furthermore, it is noted that additional left turns were added to the movement due to background traffic growth within the immediate neighbourhood. As mentioned within **Section 4.2**, it is anticipated that further development of the lands north of Nisbet Boulevard would be accompanied by an additional connection to Centre Road via the East West Arterial that is being designed and constructed by the City of Hamilton. This new connection would distribute the traffic and reduce the experienced delays. Paradigm maintained this approach to be more conservative and identify a worst case scenario.

No remedial measures are deemed necessary for this intersection.

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2023 (Total Traffic)
Region/City/Township: City of Hamilton

Major Street: Parkside Drive
Minor Street: Cole Street
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? Y
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Parkside Drive						Cole Street						
	Eastbound			Westbound			Northbound			Southbound			Peds
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Crossing
AM Peak Hour	24	568			333	25				46		59	22
PM Peak Hour	55	476			700	84				42		38	3
Average Hourly Volume	20	261	0	0	258	27	0	0	0	22	0	24	6

Warrant	AHV
1A - All	613
1B - Minor	46
2A - Major	566
2B - Cross	28

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	613
					% Fulfilled	85.1%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	180	255	180	255	46
					% Fulfilled	18.1%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	566
					% Fulfilled	78.6%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	28
					% Fulfilled	37.7%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2023 (Total Traffic)
Region/City/Township: City of Hamilton

Major Street: Hamilton Street North / Centre Roac
Minor Street: Nisbet Boulevard
North/South?: Y

Number of Approach Lanes: 1
Tee Intersection? Y
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Hamilton Street North / Centre Road						Nisbet Boulevard						
	Northbound			Southbound			Eastbound			Westbound			Peds
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Crossing
AM Peak Hour	60	493			632	23	91		199				3
PM Peak Hour	42	97			115	587	578		62				0
Average Hourly Volume	26	148	0	0	187	153	167	0	65	0	0	0	1

Warrant	AHV
1A - All	745
1B - Minor	233
2A - Major	512
2B - Cross	168

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	745
					% Fulfilled	103.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	180	255	180	255	233
					% Fulfilled	91.2%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	512
					% Fulfilled	71.1%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	168
					% Fulfilled	224.0%

6 Transportation Demand Management

Transportation Demand Management (TDM) refers to ways of making the capacity of our roads more efficient by reducing vehicle demand. TDM approaches consider how people's choices of travel mode are affected by land use patterns, development design, parking availability, parking cost, and the relative cost, convenience and availability of alternative modes of travel. Various TDM strategies are used to influence those factors so that the alternatives are more competitive with driving alone and potentially reduce reliance on motor vehicles.

TDM strategies at a development can be divided into two basic categories.

- Pre-occupancy: things that need to be done while a development is being designed and built, and
- Post-occupancy: things that can be done once people are using the development.

The pre-occupancy actions are critical because they are most likely to determine how attractive, convenient, and safe alternative travel will be once the site is occupied. Before a site is occupied, or during a remodel/ renovation, it can be designed to be convenient and safe for pedestrians and cyclists, and vehicle parking can be provided to meet but not exceed demand.

After the development is built, incentives can be offered, but those incentives will not work as well if the site and its surroundings are oriented to motor vehicles. The incentives generally include subsidies to use transit or rideshare and information about where and how to use alternatives.

TDM is one of the tools that municipalities are using to create a more vibrant and sustainable community.

6.1 Transportation Policy and Strategies

The City of Hamilton is actively engaging the development community to integrate Travel Demand Management (TDM) in all current and future development applications.

The City's guidelines were created as a tool for developers and City staff to include TDM initiatives into the development approval process. The guideline contains information about ways to integrate TDM into new developments, redevelopments and existing buildings. It also provides a framework for documenting these efforts[4].

[4] TDM for Development, City of Hamilton, Prepared by IBI Group, October 2014.

The purpose of the TDM Study is to outline a clear process for selecting and implementing TDM strategies and also structuring and evaluating the City of Hamilton TDM program.

The TDM study is supported by the Regional Transportation Plan (RTP) published by Metrolinx for the Greater Toronto and Hamilton Area (GTHA).

As the GTHA is Canada's largest and fastest growing urban region, the region is becoming increasingly dependent on and designed for automobiles. With traffic congestion already costing commuters and the economy billions of dollars every year, the RTP has developed strategies that will contribute to the transformation of the GTHA transportation system.

One of these strategies focuses on building communities that are pedestrian, cycling and transit-supportive. How we design our communities is a major factor in determining how we choose to travel.

6.2 Area Description

The proposed development is located north of Parkside Drive and west of Hamilton Street. The area surrounding the subject site will ultimately consist of residential land uses with some pockets of commercial establishments further south of the study area.

The use and reliance on non-auto modes is an important consideration in assessing appropriate TDM measures. To determine the multi-modal supportive environment, information on primary modes of transportation for all home to work based trips was extracted from the 2011 Transportation Tomorrow Survey (TTS). Traffic zones within Watedown have only been included to determine the current mode split for the immediate area.

The detailed mode of travel summary is provided in **Table 6.1**.

TABLE 6.1: TTS MODE SPLIT (TZ 5228)

Modes of Travel	Waterdown
Walk	0.4%
Vehicle (Driver)	95.9%
Vehicle (Passenger)	3.3%
Transit	0.3%
Cycle	0.0%
Total	100.0%
Sustainable Modal Split (Transit/Walk/Cycle)	**0.8%**

Sustainable modes of travel are relatively low within the immediate area as the 2011 TTS data suggests 99% of trips are completed by vehicles. These results are noted to be significantly less than the targets and goals set out within the City of Hamilton's Transportation Master Plan (HTMP) for reducing vehicle dependency by 15% by year 2021.

A major contributing factor to the high usage of vehicle trips within Waterdown is due to the suburban nature of land use and low density residential uses. The existing transportation network is also limited in terms of cycling and transit facilities.

6.3 Transportation Demand Management Plan

A Transportation Demand Management Plan (TDMP) is a strategy using policies, programs, services, and products that result in more efficient usage of transportation resources. A TDMP is designed to assist people and organizations to get where they are going by being environmentally, economically, and socially responsible for their transportation actions.

The intent of this plan is not to force residents of the development to change their travel patterns but to provide them options to make choices that may not have been available to them previously.

The objective is to provide the means for residents to take advantage of opportunities so they are better equipped in making their own transportation choices.

6.3.1 Cycling

By providing additional opportunities and safeguards for residents that choose to travel to/from the development through cycling, sustainable transportation and a reduction in automobile trips and parking requirements is expected to occur.

Of importance to note is that there is currently no on road bicycle lanes along any of the study area roadways. The lack of a dedicated cycling lanes will not prohibit this type of travel, as cyclists are permitted to ride on most roads except controlled access highways. However, without the presence of dedicated cycling lanes, it will be difficult in attracting a significant cycling ridership, primarily if riders are not comfortable with sharing a travel lane with other vehicles.

The proposed site plan does not provide for any outdoor bicycle parking areas (e.g. post and ring, racks, etc.). As this is a residential townhouse complex rather than an apartment complex, residents and visitors to the site have the option of storing bicycles on their property or auxiliary structures such as a shed. Based on this, a separate area for outdoor bicycle parking is not a requirement for this development.

6.3.2 Walking

Similar to cycling, providing a safe and attractive environment for residents that choose to walk to/from the development will contribute towards achieving a more sustainable transportation network.

The proposed site plan indicates that a concrete pedestrian walkway at least 1.5 metres in width will be provided on at least one side of the internal roadways with the exception to short cul-de-sac's/dead end streets. The walkways and sidewalks should be illuminated at night by appropriate light posts. All curbs intersecting at roadways should also be provided with a depressed curb to accommodate a barrier free design.

An east-west sidewalk is also proposed linking the internal network to the external network. This east-west connection is located centrally along the developments frontage to Centre Street which will further promote and accommodate active modes of travel to/from the development.

Sidewalks that are discontinuous and require pedestrians to cross the internal roadway should be marked through signage or pavement markings such as a ladder crossing or hardscaped to further emphasis the presence of these crossings. As the development is noted to be a rather small townhouse complex, pedestrian ahead signage (WC-7 – Book 6, Ontario Traffic Manual) is noted to be sufficient and should be considered for the internal crossings.

The proposed development satisfies the City's TDM policy for walking.

6.3.3 Transit

Transit within Waterdown is currently limited to a single route operated by the HSR. Route 18 serves the community of Waterdown via Parkside Drive, Hollybush Drive, Dundas Street, Spring Creek Drive and Waterdown Road, and connects its resident to GO Transit commuter services at the Aldershot GO Station. Service runs on weekdays (5am-9pm) and Saturdays (8am-9pm) with no service on Sundays or holidays.

Bus stops are located within 250 metres of the development on both the north and south sides of Parkside Drive at the intersection of Hamilton Street North. These stops however do not have a hardscaped landing pad, sitting area or a weather protected waiting area and generally do not comply with the City's TDM policy for transit use.

The 2011 TTS data identified that less than 1% of residents within Waterdown utilize transit as a mode of transportation. This is noted to be significantly low with the majority of transit usage expected to be a result of commuters using HSR for a direct connection to the Aldershot GO Station.

To attract a greater transit ridership for the Waterdown community, a broader transit network is expected to be required that provide connections

outside of the immediate area. Without a well-connected network provided, transit usage for the proposed development and overall community is not expected to see significant growth.

Additionally, promotion and additional incentives by the local and regional transit authorities could be considered to further inform and help guide residents to further utilize Route 18 as a primary mode choice to/from the Aldershot GO Station.

6.3.4 Carshare/Bikeshare

Carsharing refers to automobile rental services intended to substitute for private vehicle ownership. It makes occasional use of a vehicle affordable, even for low-income households, while providing an incentive to minimize driving and rely on alternative travel options as much as possible.

Where carsharing services are available, some households reduce their vehicle ownership, either shifting from two to one vehicle, or from one to zero vehicles. The use of carshare benefits employees as well as nearby residents and businesses in suitable environments.

As visitor parking is typically heavily utilized within townhouse complexes such as this one, the proposed visitor parking supply is considered appropriate. Additionally, given the small nature of the development, a carshare vehicle is also not expected to see a substantial amount of benefits as opposed to if a carshare space(s) were provided at a large condominium/apartment complex.

Bikeshare operates in a similar way as carshare. The City of Hamilton, in partnership with Social Bicycles, has implemented a bike share program in Hamilton. The program offers a system of 750 bicycles at over 100 stations.

Hamilton's bikeshare is currently limited to the lower part of Hamilton. A station located outside of the existing area could be considered if enough interest at the local level and adequate sponsorship is obtained. Discussions with Sobi Hamilton should be considered if enough interest for these services is expressed. The provision of bikeshare is an option that can be further pursued by local community rather than the proposed development.

6.3.5 Parking

A parking management plan recognizes the need to provide adequate parking, but values strategies which result in more efficient use of parking resources and reduce the amount of parking needed at a particular location.

Rather than establish generous parking requirements to satisfy the maximum potential demand that may occur, parking management allows contingency-based planning, which means that various solutions are identified which can be deployed if needed.

The City's TDM Policy provides guidelines indicating that reducing parking spaces should not exacerbate any current parking issues, however reducing the number of parking spaces should be explored to further encourage residents to utilize other modes of travel.

Based on the site plan statistics a total of 12 parking spaces for visitors and a total of 128 spaces for residents will be provided. With the development supplying 140 parking spaces, the minimum requirements as stipulated in the Town of Flamborough Zoning By-Law 90-145-Z is met as 1.0 parking space per unit is only required for street townhouses.

As visitor and residential parking is typically heavily utilized within townhouse complexes such as this one and the mode split for Waterdown is mostly car dependent, the proposed parking supply is considered appropriate.

In the event that visitor parking is seldom used, some of these spaces could be converted to carshare/bikeshare space or even allocated to more outdoor amenity space such as a patio or community garden. However, this would need to be explored later through the condominium corporation and further supported by the residents of the development once the community has been established.

6.3.6 Travel Planning

Increasing awareness of sustainable transportation opportunities for residents of the development could be considered. New residents of the townhouse complex should be provided with a welcome package that outlines the close proximity of transit stops in relation to the development and promote the route which has direct connections to the Aldershot GO Station.

Providing awareness of commuting events such as, bike to work day and promotional material that inform residents that all HSR buses are equipped with bike racks could be arranged by the local community and held at the local church, shopping centre or school. These events could be organized with the help of the City and Hamilton and HSR to hold regular spring and fall special events to promote sustainable transportation. Some of these events could further include demonstrations on how to properly load and unload a bicycle onto a HSR bus as well as a workshop to problem solve issues the community is experiencing with incorporating sustainable travel.

A fully engaged travel plan will help to engage and educate residents and the community of available sustainable modes of travel and how to overcome obstacles that maybe perceived.

6.3.7 Education

General education of all modes of travel, including their benefits and how to make the best use of them, are a key component to TDM success. The strategies require cooperation and coordination with several partners,

including transit providers, developers, condominium corporations, the local municipality and community.

By educating residents of the development and the overall community about other sustainable modes of travel as well as providing travel demand management tools and incentives, TDM can be further integrated within the development to help promote other modes of transportation. To educate residents of this development, highlighting TDM elements in the marketing material is highly encouraged. This can include specifics such as proximity to transit, cycling facilities and the proximity to local commercial and employment establishments.

6.4 Summary

The site plan has been developed utilizing TDM measures as identified by the City of Hamilton's TDM policy for residential uses. These measures include:

- Safe and attractive walkways for pedestrians linking units with sidewalks.
- Walking paths to connect the development with surrounding neighbourhood.
- Bus stops are located within 250 metres of the proposed development that provide a direct connection to the Aldershoot GO Station.
- To further enhance the developments non-vehicular connections, an east-west multi-use pathway is proposed centrally along the development's frontage to Hamilton Street North.

Additional measures that are currently not implemented on the site could be undertaken to further help promote and encourage TDM are:

- Pedestrian ahead signage (WC-7) as outlined in the Ontario Traffic Manual Book 6 should be considered at locations within the development where discontinuous sidewalks require pedestrians to cross the internal roadway.
- Discussions with local bikeshare providers be considered if enough interest from residents and the local community is expressed for this service.
- Provide general education of all travel mode options that identify benefits and how residents can best utilize these modes. New residents should be provided with a welcome package that outlines proximity of transit stops in relation to the development and provides promotional material that emphasis the route directly connections to the Aldershot GO Station.

The measures noted above will help provide residents with the necessary tools to help incorporate sustainable transportation, however to further help promote other mode choices, a much broader network of cycling lanes, pedestrian sidewalks and transit service will be required, not just within the immediate study area, but within the overall community.

Additionally, developing and promoting livable communities that encourage residents who live in Hamilton to work in Hamilton is expected to be another proponent of change to achieve this target, particularly within Waterdown given limited employment opportunities within the community.

7 Conclusions and Recommendations

7.1 Conclusions

Based on the analyses contained in the report, it is concluded that:

- **under existing conditions** at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.92) during the AM peak hour; and
  - the westbound through-right movement operates at LOS F (v/c = 1.06) during the PM peak hour.
- **under 2023 background conditions** at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.97) during the AM peak hour;
  - the westbound through-right movement operates at LOS F (v/c = 1.01) during the PM peak hour;
  - the northbound left movement operates at LOS F (v/c = 0.97) during the PM peak hour; and
  - the southbound left and through-right movements operate at LOS E (v/c = 0.92 and v/c = 0.97, respectively).
- **under 2023 background conditions** at the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road:
  - the eastbound left movement operates at LOS F (v/c = 0.73 and v/c = 0.49) during the AM and PM peak hour.
- the proposed development is forecast to produce about 27 net new trips during the AM peak hour (5 in and 22 out), and 32 net new trips during the PM peak hour (22 in and 10 out);
- **under 2023 total conditions** at the intersection of Parkside Drive and Hamilton Street North:
  - the eastbound through-right movement operates at LOS E (v/c = 0.97) during the AM peak hour;
  - the westbound through-right movement operates at LOS F (v/c = 1.01) during the PM peak hour;
  - the northbound left movement operates at LOS F (v/c = 0.98) during the PM peak hour; and
  - the southbound left and through-right movements operate at LOS E (v/c = 0.89 and v/c = 0.94, respectively).

- **under 2023 total conditions** at the intersection of Nisbet Boulevard and Hamilton Street North/Centre Road:
  - the eastbound left movement operates at LOS F (v/c = 0.77 and v/c = 0.57) during the AM and PM peak hour.
- traffic control signals would not be warranted at any intersections within the study area under any horizon;
- auxiliary left turn lanes would not be warranted at any intersections within the study area under any horizon;
- right turn volumes on each leg of the intersection of Parkside Drive and Hamilton Street North are in excess of 100 vehicles during either the AM or PM peak hour; and
- with implementation of right turn lanes, the intersection of Parkside Drive and Hamilton Street North will operate at significantly improved levels (average vehicle delay decreases of approximately 10 seconds in AM peak hour and 30 seconds in PM peak hour).

7.2 Recommendations

Based on the foregoing, it is recommended that:

- the City of Hamilton recognize the conclusions drawn above; and
- the City of Hamilton consider implementing auxiliary right turn lanes as a result of background traffic at the intersection of Parkside Drive and Hamilton Street North to reduce traffic delays;
- the development be approved for construction with no requirements for off-site transportation network improvements.
- to promote alternative modes and further reduce the dependency on automobile use, the owner and City investigate, evaluate and implement TDM programs and measures as identified.

Appendix A

2016 Existing Traffic Counts

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Centre Road Hamilton Street & Parkside Drive
Site Code:
Start Date: 05/26/2016

Turning Movement Data

Start Time	Parkside Drive Eastbound						Parkside Drive Westbound						Hamilton Street Northbound						Centre Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	25	86	15	0	1	126	3	37	9	0	1	49	10	17	15	0	3	42	29	32	15	0	0	76	293
7:15 AM	18	116	5	0	0	139	14	35	14	0	0	63	5	35	23	0	0	63	48	36	11	0	0	95	360
7:30 AM	33	131	16	0	0	180	14	38	18	0	0	70	21	31	15	0	3	67	44	42	20	0	1	106	423
7:45 AM	27	98	18	0	5	143	25	53	21	0	0	99	31	61	21	0	11	113	54	52	39	0	5	145	500
Hourly Total	103	431	54	0	6	588	56	163	62	0	1	281	67	144	74	0	17	285	175	162	85	0	6	422	1576
8:00 AM	22	117	18	0	0	157	17	58	24	0	0	99	25	28	21	0	0	74	53	52	48	0	0	153	483
8:15 AM	31	111	11	0	1	153	14	40	17	0	0	71	13	48	24	0	0	85	51	69	27	0	0	147	456
8:30 AM	51	81	22	0	0	154	16	34	19	0	0	69	11	55	12	0	2	78	43	71	42	0	0	156	457
8:45 AM	16	82	26	0	0	124	11	46	18	0	0	75	23	34	16	0	0	73	32	69	45	0	0	146	418
Hourly Total	120	391	77	0	1	588	58	178	78	0	0	314	72	165	73	0	2	310	179	261	162	0	0	602	1814
9:00 AM	18	77	26	0	1	121	20	37	13	0	0	70	17	22	19	0	4	58	26	36	17	0	0	79	328
9:15 AM	17	60	20	0	0	97	17	28	13	0	0	58	17	30	5	0	4	52	28	52	21	0	0	101	308
9:30 AM	17	61	18	0	1	96	13	28	13	0	1	54	10	30	16	0	7	56	17	37	18	0	0	72	278
9:45 AM	20	33	12	0	1	65	18	18	16	0	0	52	17	31	13	0	1	61	14	50	12	0	0	76	254
Hourly Total	72	231	76	0	3	379	68	111	55	0	1	234	61	113	53	0	16	227	85	175	68	0	0	328	1168
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	36	52	21	0	0	109	24	51	25	0	0	100	20	72	15	0	3	107	23	64	28	0	0	115	431
3:15 PM	13	44	22	0	1	79	32	59	25	0	0	116	29	67	14	0	2	110	29	72	32	0	2	133	438
3:30 PM	25	53	32	0	3	110	38	59	24	0	0	121	28	65	13	0	1	106	26	60	19	0	1	105	442
3:45 PM	24	50	28	0	1	102	29	71	28	0	4	128	28	69	19	0	3	116	25	54	24	0	5	103	449
Hourly Total	98	199	103	0	5	400	123	240	102	0	4	465	105	273	61	0	9	439	103	250	103	0	8	456	1760
4:00 PM	37	59	24	0	1	120	48	81	31	0	2	160	24	80	18	0	0	122	28	72	27	0	1	127	529
4:15 PM	18	61	26	0	0	105	48	93	26	0	0	167	28	63	28	0	2	119	29	67	29	0	0	125	516
4:30 PM	27	61	24	0	1	112	62	92	27	0	1	181	24	70	20	0	1	114	32	86	43	0	1	161	568
4:45 PM	33	68	29	0	1	130	59	104	22	0	2	185	32	69	24	0	5	125	33	71	26	0	1	130	570
Hourly Total	115	249	103	0	3	467	217	370	106	0	5	693	108	282	90	0	8	480	122	296	125	0	3	543	2183
5:00 PM	22	79	31	0	1	132	67	124	17	0	1	208	29	89	21	0	1	139	35	87	29	0	0	151	630
5:15 PM	32	77	27	0	1	136	48	122	27	1	0	198	42	74	26	0	1	142	34	81	26	0	1	141	617
5:30 PM	41	81	23	0	3	145	58	120	34	1	1	213	34	85	17	0	2	136	33	81	28	0	2	142	636
5:45 PM	24	69	27	0	7	120	56	111	42	0	1	209	20	103	25	0	5	148	28	46	16	0	0	90	567
Hourly Total	119	306	108	0	12	533	229	477	120	2	3	828	125	351	89	0	9	565	130	295	99	0	3	524	2450
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	627	1807	521	0	30	2955	751	1539	523	2	14	2815	538	1328	440	0	61	2306	794	1439	642	0	20	2875	10951
Approach %	21.2	61.2	17.6	0.0	-	-	26.7	54.7	18.6	0.1	-	-	23.3	57.6	19.1	0.0	-	-	27.6	50.1	22.3	0.0	-	-	-
Total %	5.7	16.5	4.8	0.0	-	27.0	6.9	14.1	4.8	0.0	-	25.7	4.9	12.1	4.0	0.0	-	21.1	7.3	13.1	5.9	0.0	-	26.3	-
Lights	604	1747	495	0	-	2846	731	1460	492	2	-	2685	509	1287	416	0	-	2212	757	1395	609	0	-	2761	10504
% Lights	96.3	96.7	95.0	-	-	96.3	97.3	94.9	94.1	100.0	-	95.4	94.6	96.9	94.5	-	-	95.9	95.3	96.9	94.9	-	-	96.0	95.9

Mediums	23	51	24	0	-	98	18	70	29	0	-	117	29	40	21	0	-	90	36	42	33	0	-	111	416
% Mediums	3.7	2.8	4.6	-	-	3.3	2.4	4.5	5.5	0.0	-	4.2	5.4	3.0	4.8	-	-	3.9	4.5	2.9	5.1	-	-	3.9	3.8
Articulated Trucks	0	9	2	0	-	11	2	9	2	0	-	13	0	1	3	0	-	4	1	2	0	0	-	3	31
% Articulated Trucks	0.0	0.5	0.4	-	-	0.4	0.3	0.6	0.4	0.0	-	0.5	0.0	0.1	0.7	-	-	0.2	0.1	0.1	0.0	-	-	0.1	0.3
Pedestrians	-	-	-	-	30	-	-	-	-	-	14	-	-	-	-	-	61	-	-	-	-	-	20	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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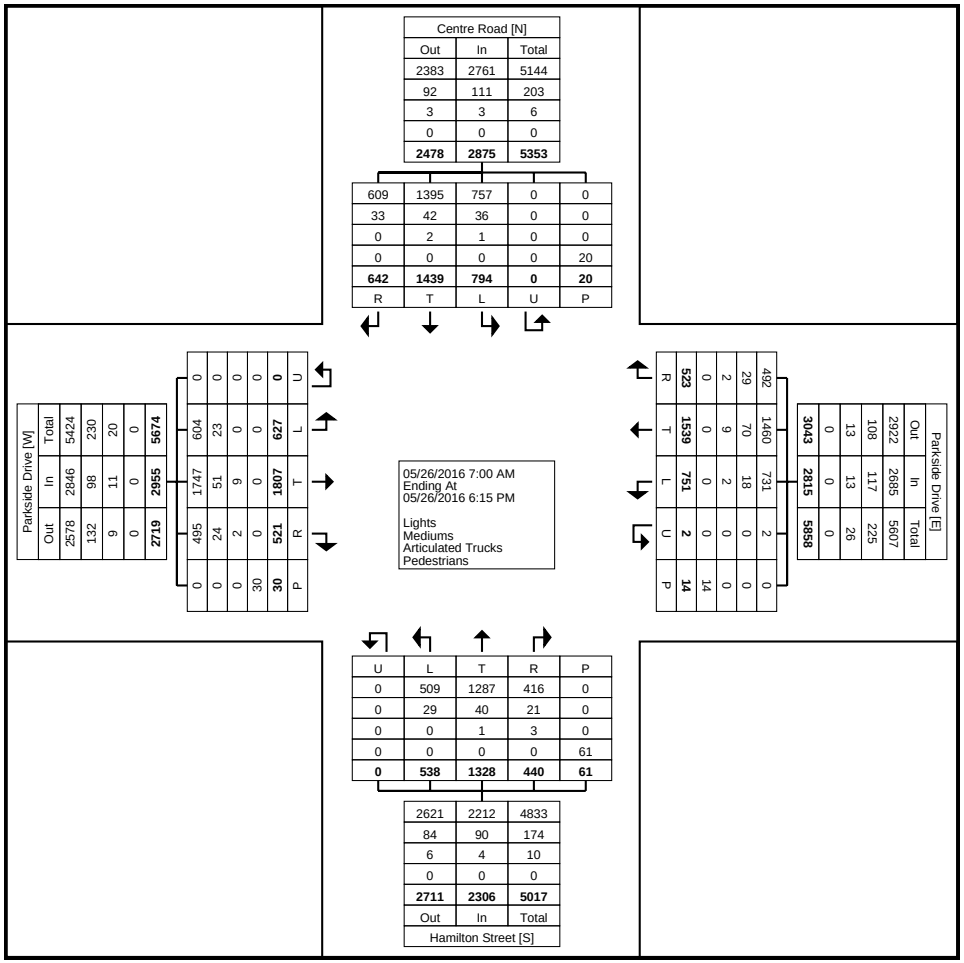
Start Date: 05/26/2016



Turning Movement Data Plot

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Centre Road Hamilton Street & Parkside Drive
Site Code:
Start Date: 05/26/2016

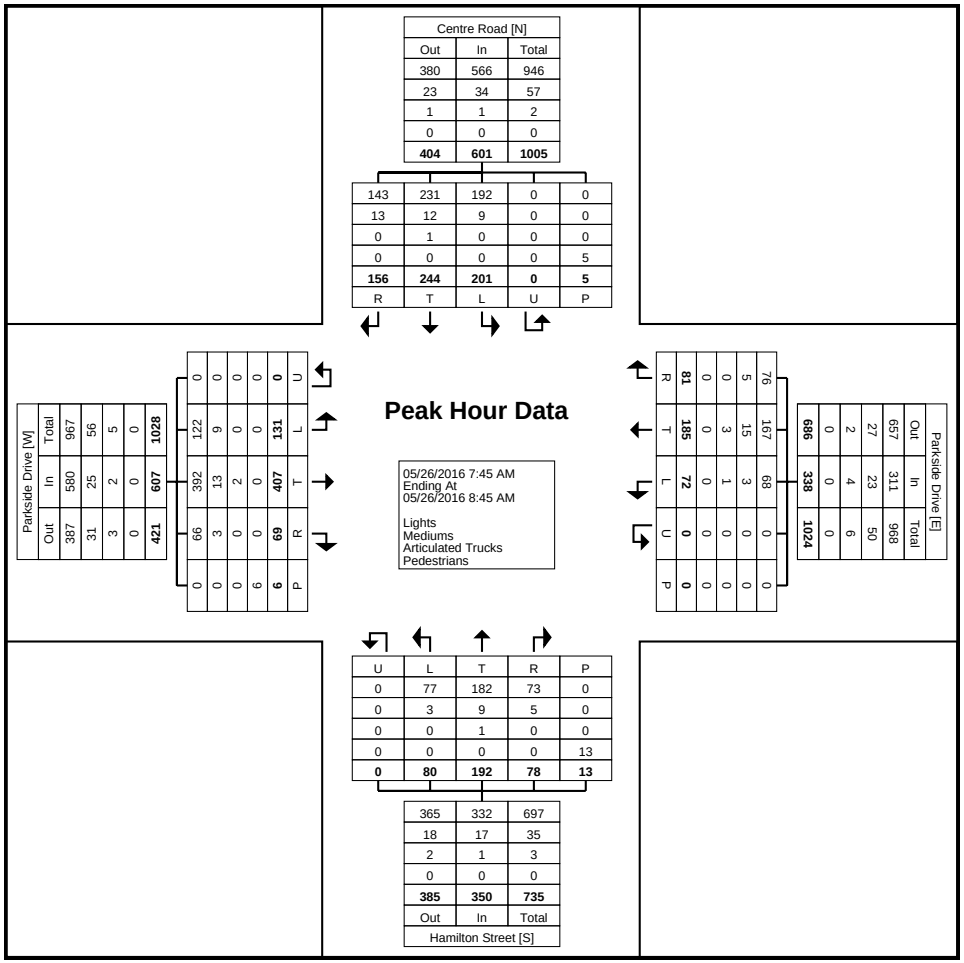
Turning Movement Peak Hour Data (7:45 AM)

Start Time	Parkside Drive Eastbound						Parkside Drive Westbound						Hamilton Street Northbound						Centre Road Southbound						
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Int. Total
7:45 AM	27	98	18	0	5	143	25	53	21	0	0	99	31	61	21	0	11	113	54	52	39	0	5	145	500
8:00 AM	22	117	18	0	0	157	17	58	24	0	0	99	25	28	21	0	0	74	53	52	48	0	0	153	483
8:15 AM	31	111	11	0	1	153	14	40	17	0	0	71	13	48	24	0	0	85	51	69	27	0	0	147	456
8:30 AM	51	81	22	0	0	154	16	34	19	0	0	69	11	55	12	0	2	78	43	71	42	0	0	156	457
Total	131	407	69	0	6	607	72	185	81	0	0	338	80	192	78	0	13	350	201	244	156	0	5	601	1896
Approach %	21.6	67.1	11.4	0.0	-	-	21.3	54.7	24.0	0.0	-	-	22.9	54.9	22.3	0.0	-	-	33.4	40.6	26.0	0.0	-	-	-
Total %	6.9	21.5	3.6	0.0	-	32.0	3.8	9.8	4.3	0.0	-	17.8	4.2	10.1	4.1	0.0	-	18.5	10.6	12.9	8.2	0.0	-	31.7	-
PHF	0.642	0.870	0.784	0.000	-	0.967	0.720	0.797	0.844	0.000	-	0.854	0.645	0.787	0.813	0.000	-	0.774	0.931	0.859	0.813	0.000	-	0.963	0.948
Lights	122	392	66	0	-	580	68	167	76	0	-	311	77	182	73	0	-	332	192	231	143	0	-	566	1789
% Lights	93.1	96.3	95.7	-	-	95.6	94.4	90.3	93.8	-	-	92.0	96.3	94.8	93.6	-	-	94.9	95.5	94.7	91.7	-	-	94.2	94.4
Mediums	9	13	3	0	-	25	3	15	5	0	-	23	3	9	5	0	-	17	9	12	13	0	-	34	99
% Mediums	6.9	3.2	4.3	-	-	4.1	4.2	8.1	6.2	-	-	6.8	3.8	4.7	6.4	-	-	4.9	4.5	4.9	8.3	-	-	5.7	5.2
Articulated Trucks	0	2	0	0	-	2	1	3	0	0	-	4	0	1	0	0	-	1	0	1	0	0	-	1	8
% Articulated Trucks	0.0	0.5	0.0	-	-	0.3	1.4	1.6	0.0	-	-	1.2	0.0	0.5	0.0	-	-	0.3	0.0	0.4	0.0	-	-	0.2	0.4
Pedestrians	-	-	-	-	6	-	-	-	-	-	0	-	-	-	-	-	13	-	-	-	-	-	5	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Centre Road Hamilton Street & Parkside Drive
Site Code:
Start Date: 05/26/2016



Turning Movement Peak Hour Data Plot (7:45 AM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Centre Road Hamilton Street & Parkside Drive
Site Code:
Start Date: 05/26/2016

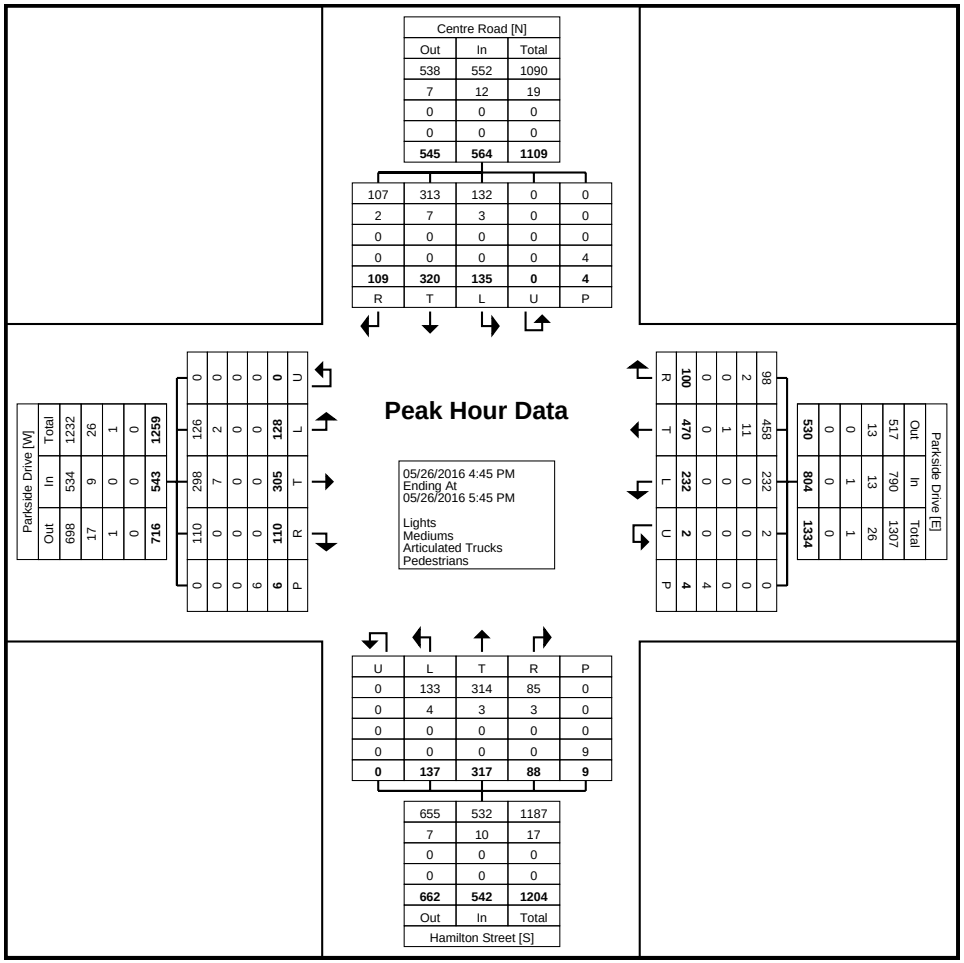
Turning Movement Peak Hour Data (4:45 PM)

Start Time	Parkside Drive Eastbound						Parkside Drive Westbound						Hamilton Street Northbound						Centre Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:45 PM	33	68	29	0	1	130	59	104	22	0	2	185	32	69	24	0	5	125	33	71	26	0	1	130	570
5:00 PM	22	79	31	0	1	132	67	124	17	0	1	208	29	89	21	0	1	139	35	87	29	0	0	151	630
5:15 PM	32	77	27	0	1	136	48	122	27	1	0	198	42	74	26	0	1	142	34	81	26	0	1	141	617
5:30 PM	41	81	23	0	3	145	58	120	34	1	1	213	34	85	17	0	2	136	33	81	28	0	2	142	636
Total	128	305	110	0	6	543	232	470	100	2	4	804	137	317	88	0	9	542	135	320	109	0	4	564	2453
Approach %	23.6	56.2	20.3	0.0	-	-	28.9	58.5	12.4	0.2	-	-	25.3	58.5	16.2	0.0	-	-	23.9	56.7	19.3	0.0	-	-	-
Total %	5.2	12.4	4.5	0.0	-	22.1	9.5	19.2	4.1	0.1	-	32.8	5.6	12.9	3.6	0.0	-	22.1	5.5	13.0	4.4	0.0	-	23.0	-
PHF	0.780	0.941	0.887	0.000	-	0.936	0.866	0.948	0.735	0.500	-	0.944	0.815	0.890	0.846	0.000	-	0.954	0.964	0.920	0.940	0.000	-	0.934	0.964
Lights	126	298	110	0	-	534	232	458	98	2	-	790	133	314	85	0	-	532	132	313	107	0	-	552	2408
% Lights	98.4	97.7	100.0	-	-	98.3	100.0	97.4	98.0	100.0	-	98.3	97.1	99.1	96.6	-	-	98.2	97.8	97.8	98.2	-	-	97.9	98.2
Mediums	2	7	0	0	-	9	0	11	2	0	-	13	4	3	3	0	-	10	3	7	2	0	-	12	44
% Mediums	1.6	2.3	0.0	-	-	1.7	0.0	2.3	2.0	0.0	-	1.6	2.9	0.9	3.4	-	-	1.8	2.2	2.2	1.8	-	-	2.1	1.8
Articulated Trucks	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.2	0.0	0.0	-	0.1	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	-	6	-	-	-	-	-	4	-	-	-	-	-	9	-	-	-	-	-	4	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Centre Road Hamilton Street & Parkside Drive
Site Code:
Start Date: 05/26/2016



Turning Movement Peak Hour Data Plot (4:45 PM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Centre Road Hamilton Street & Parkside Drive
Site Code:
Start Date: 05/26/2016

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Centre Road
Site Code:
Start Date: 05/26/2016

Turning Movement Data

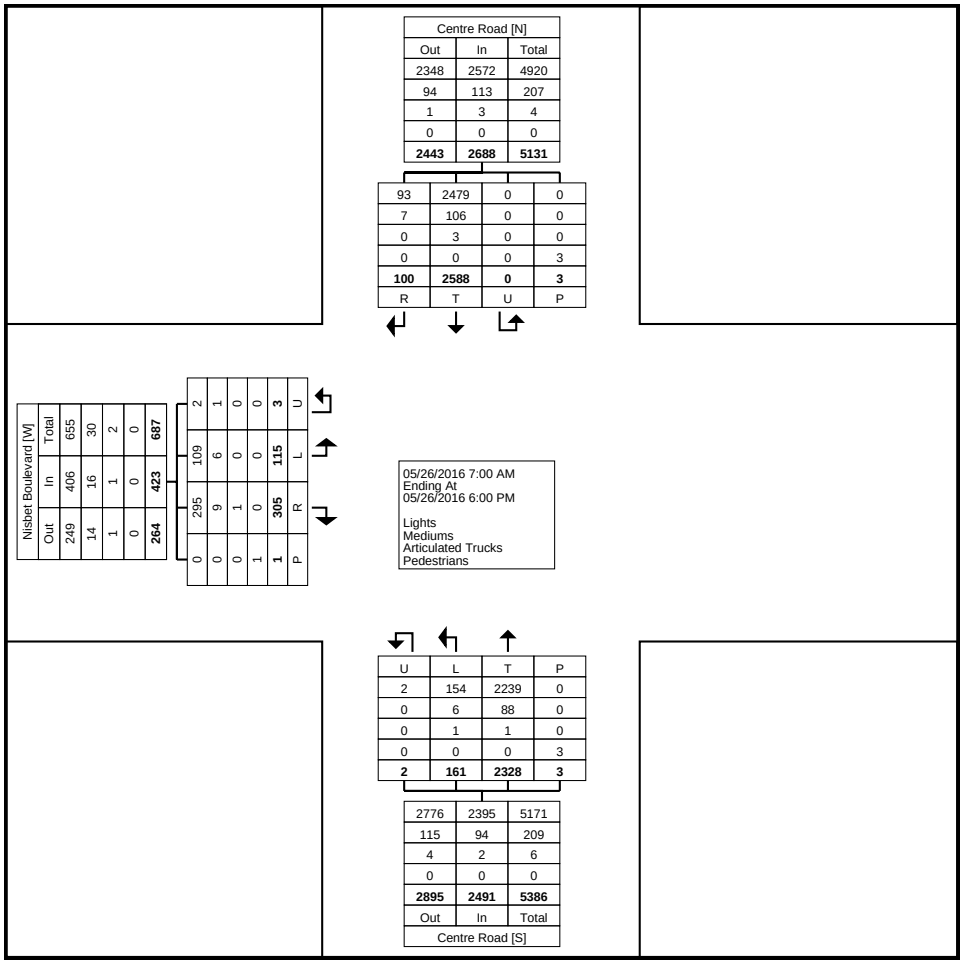
Start Time	Nisbet Boulevard Eastbound					Centre Road Northbound					Centre Road Southbound					Int. Total
	Left	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	2	21	1	0	24	1	51	0	1	52	68	1	0	0	69	145
7:15 AM	4	21	0	0	25	6	71	0	0	77	76	0	0	0	76	178
7:30 AM	10	26	1	0	37	3	90	0	0	93	92	4	0	0	96	226
7:45 AM	13	37	1	0	51	7	97	0	0	104	124	5	0	2	129	284
Hourly Total	29	105	3	0	137	17	309	0	1	326	360	10	0	2	370	833
8:00 AM	7	20	0	0	27	3	56	0	1	59	127	2	0	0	129	215
8:15 AM	17	17	0	0	34	2	121	0	0	123	129	4	0	0	133	290
8:30 AM	8	13	0	0	21	3	106	0	0	109	153	8	0	0	161	291
8:45 AM	2	11	0	0	13	1	57	0	0	58	102	0	0	0	102	173
Hourly Total	34	61	0	0	95	9	340	0	1	349	511	14	0	0	525	969
9:00 AM	2	9	0	0	11	4	46	0	0	50	84	2	0	0	86	147
9:15 AM	2	11	0	0	13	3	61	0	0	64	76	3	0	0	79	156
9:30 AM	3	3	0	0	6	2	63	0	0	65	67	2	0	0	69	140
9:45 AM	1	9	0	0	10	2	59	0	0	61	68	0	0	0	68	139
Hourly Total	8	32	0	0	40	11	229	0	0	240	295	7	0	0	302	582
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	3	7	0	0	10	12	111	0	0	123	125	5	0	0	130	263
3:15 PM	4	8	0	0	12	14	98	0	0	112	108	3	0	0	111	235
3:30 PM	3	7	0	0	10	6	112	0	0	118	96	6	0	0	102	230
3:45 PM	4	12	0	0	16	8	119	0	0	127	99	2	0	0	101	244
Hourly Total	14	34	0	0	48	40	440	0	0	480	428	16	0	0	444	972
4:00 PM	3	10	0	1	13	11	130	0	0	141	126	5	0	1	131	285
4:15 PM	2	6	0	0	8	11	101	0	1	112	123	12	0	0	135	255
4:30 PM	6	9	0	0	15	9	115	1	0	125	145	7	0	0	152	292
4:45 PM	2	13	0	0	15	10	111	0	0	121	121	5	0	0	126	262
Hourly Total	13	38	0	1	51	41	457	1	1	499	515	29	0	1	544	1094
5:00 PM	3	8	0	0	11	6	122	0	0	128	153	4	0	0	157	296
5:15 PM	4	9	0	0	13	19	131	0	0	150	127	4	0	0	131	294
5:30 PM	5	10	0	0	15	11	147	0	0	158	107	9	0	0	116	289
5:45 PM	5	8	0	0	13	7	153	1	0	161	92	7	0	0	99	273
Hourly Total	17	35	0	0	52	43	553	1	0	597	479	24	0	0	503	1152
Grand Total	115	305	3	1	423	161	2328	2	3	2491	2588	100	0	3	2688	5602
Approach %	27.2	72.1	0.7	-	-	6.5	93.5	0.1	-	-	96.3	3.7	0.0	-	-	-
Total %	2.1	5.4	0.1	-	7.6	2.9	41.6	0.0	-	44.5	46.2	1.8	0.0	-	48.0	-
Lights	109	295	2	-	406	154	2239	2	-	2395	2479	93	0	-	2572	5373
% Lights	94.8	96.7	66.7	-	96.0	95.7	96.2	100.0	-	96.1	95.8	93.0	-	-	95.7	95.9
Mediums	6	9	1	-	16	6	88	0	-	94	106	7	0	-	113	223
% Mediums	5.2	3.0	33.3	-	3.8	3.7	3.8	0.0	-	3.8	4.1	7.0	-	-	4.2	4.0

Articulated Trucks	0	1	0	-	1	1	1	0	-	2	3	0	0	-	3	6
% Articulated Trucks	0.0	0.3	0.0	-	0.2	0.6	0.0	0.0	-	0.1	0.1	0.0	-	-	0.1	0.1
Pedestrians	-	-	-	1	-	-	-	-	3	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Centre Road
Site Code:
Start Date: 05/26/2016



Turning Movement Data Plot

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Centre Road
Site Code:
Start Date: 05/26/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Nisbet Boulevard Eastbound					Centre Road Northbound					Centre Road Southbound					
	Left	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Int. Total
7:45 AM	13	37	1	0	51	7	97	0	0	104	124	5	0	2	129	284
8:00 AM	7	20	0	0	27	3	56	0	1	59	127	2	0	0	129	215
8:15 AM	17	17	0	0	34	2	121	0	0	123	129	4	0	0	133	290
8:30 AM	8	13	0	0	21	3	106	0	0	109	153	8	0	0	161	291
Total	45	87	1	0	133	15	380	0	1	395	533	19	0	2	552	1080
Approach %	33.8	65.4	0.8	-	-	3.8	96.2	0.0	-	-	96.6	3.4	0.0	-	-	-
Total %	4.2	8.1	0.1	-	12.3	1.4	35.2	0.0	-	36.6	49.4	1.8	0.0	-	51.1	-
PHF	0.662	0.588	0.250	-	0.652	0.536	0.785	0.000	-	0.803	0.871	0.594	0.000	-	0.857	0.928
Lights	44	84	1	-	129	12	359	0	-	371	503	15	0	-	518	1018
% Lights	97.8	96.6	100.0	-	97.0	80.0	94.5	-	-	93.9	94.4	78.9	-	-	93.8	94.3
Mediums	1	3	0	-	4	3	21	0	-	24	29	4	0	-	33	61
% Mediums	2.2	3.4	0.0	-	3.0	20.0	5.5	-	-	6.1	5.4	21.1	-	-	6.0	5.6
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	1	0	0	-	1	1
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.2	0.0	-	-	0.2	0.1
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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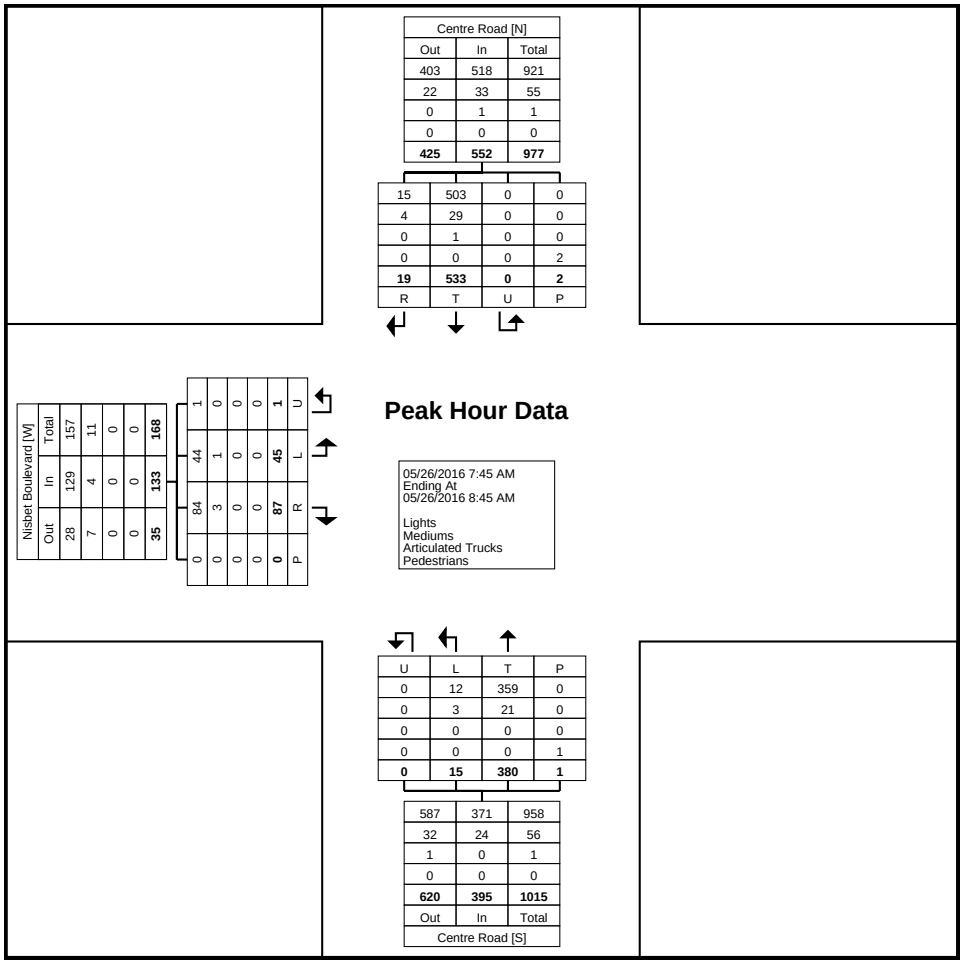
Count Name: Nisbet Boulevard & Centre Road
Site Code:
Start Date: 05/26/2016



Turning Movement Peak Hour Data Plot (7:45 AM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Centre Road
Site Code:
Start Date: 05/26/2016

Turning Movement Peak Hour Data (5:00 PM)

Start Time	Nisbet Boulevard Eastbound					Centre Road Northbound					Centre Road Southbound					
	Left	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Int. Total
5:00 PM	3	8	0	0	11	6	122	0	0	128	153	4	0	0	157	296
5:15 PM	4	9	0	0	13	19	131	0	0	150	127	4	0	0	131	294
5:30 PM	5	10	0	0	15	11	147	0	0	158	107	9	0	0	116	289
5:45 PM	5	8	0	0	13	7	153	1	0	161	92	7	0	0	99	273
Total	17	35	0	0	52	43	553	1	0	597	479	24	0	0	503	1152
Approach %	32.7	67.3	0.0	-	-	7.2	92.6	0.2	-	-	95.2	4.8	0.0	-	-	-
Total %	1.5	3.0	0.0	-	4.5	3.7	48.0	0.1	-	51.8	41.6	2.1	0.0	-	43.7	-
PHF	0.850	0.875	0.000	-	0.867	0.566	0.904	0.250	-	0.927	0.783	0.667	0.000	-	0.801	0.973
Lights	17	35	0	-	52	43	549	1	-	593	473	24	0	-	497	1142
% Lights	100.0	100.0	-	-	100.0	100.0	99.3	100.0	-	99.3	98.7	100.0	-	-	98.8	99.1
Mediums	0	0	0	-	0	0	4	0	-	4	6	0	0	-	6	10
% Mediums	0.0	0.0	-	-	0.0	0.0	0.7	0.0	-	0.7	1.3	0.0	-	-	1.2	0.9
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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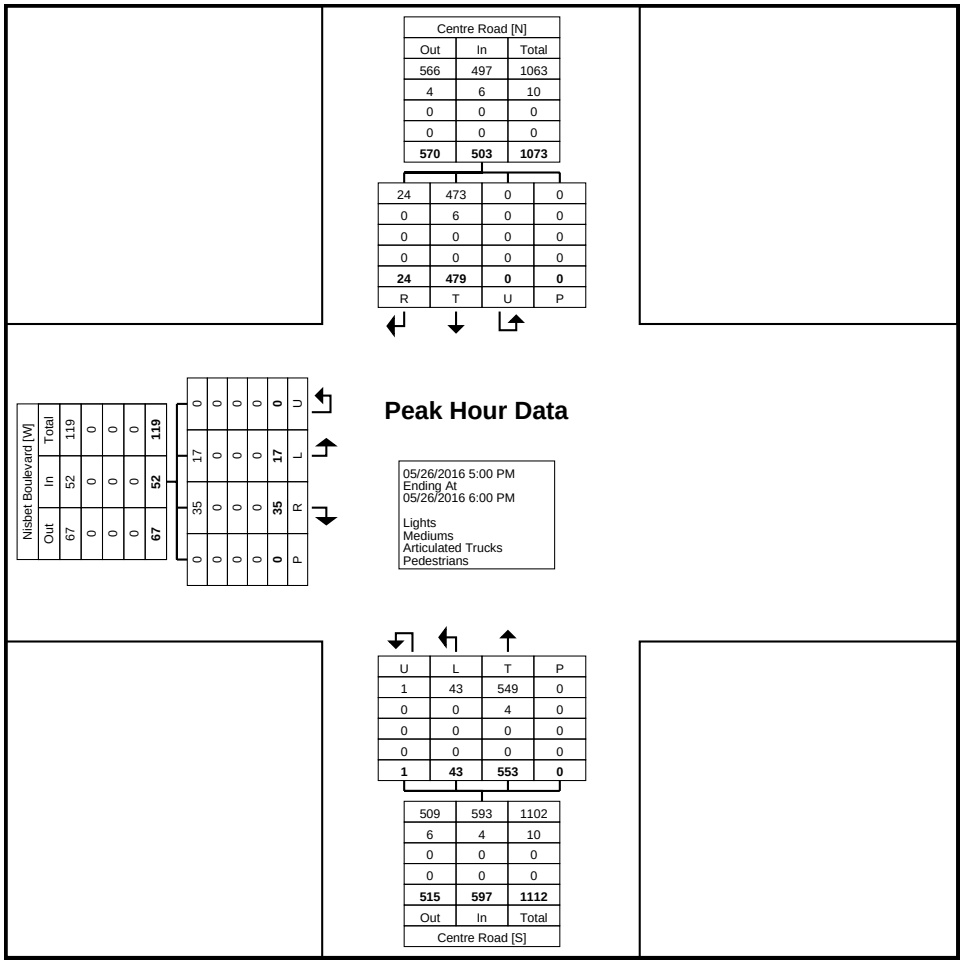
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Centre Road
Site Code:
Start Date: 05/26/2016



Turning Movement Peak Hour Data Plot (5:00 PM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Centre Road
Site Code:
Start Date: 05/26/2016

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Cole Street
Site Code:
Start Date: 05/26/2016

Turning Movement Data

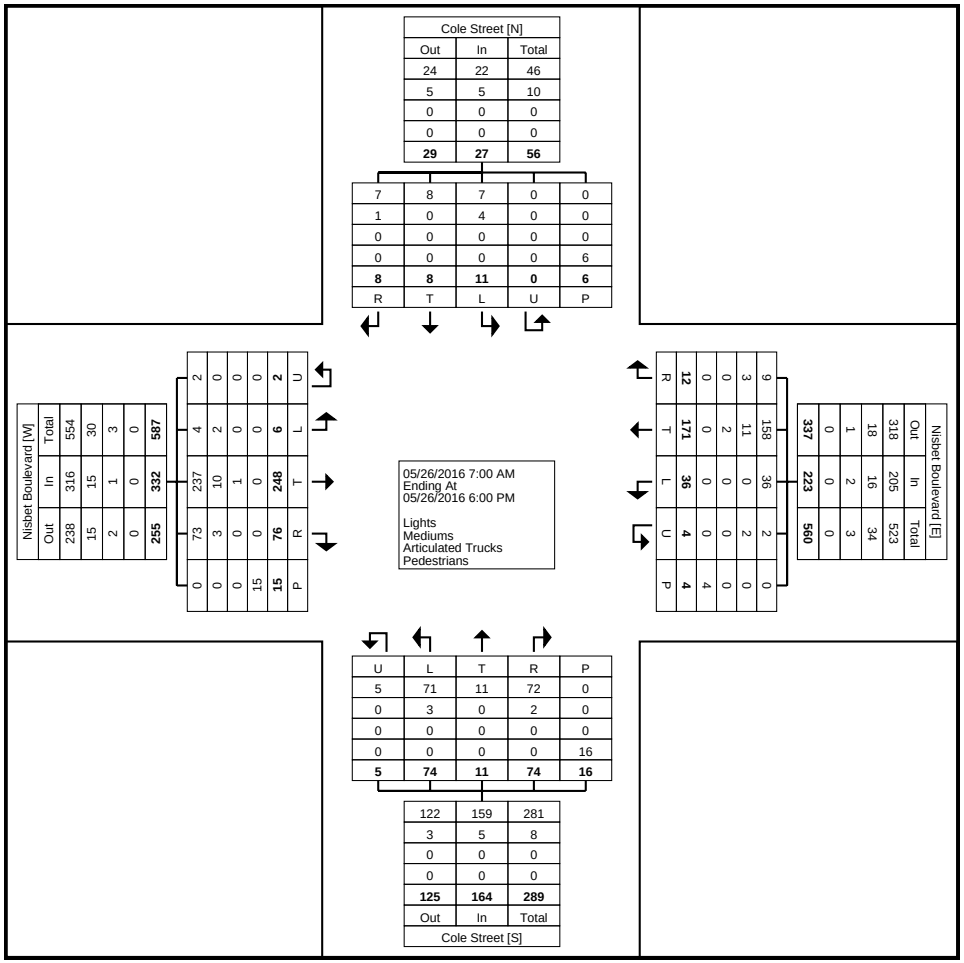
Start Time	Nisbet Boulevard Eastbound						Nisbet Boulevard Westbound						Cole Street Northbound						Cole Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	16	2	0	0	18	0	3	0	0	0	3	2	2	3	0	0	7	2	1	0	0	1	3	31
7:15 AM	0	7	3	0	0	10	1	5	2	0	0	8	3	1	6	0	0	10	1	0	1	0	0	2	30
7:30 AM	0	20	3	0	0	23	2	6	0	0	0	8	2	0	5	0	0	7	0	0	1	0	0	1	39
7:45 AM	1	27	4	0	0	32	0	11	1	1	0	13	0	0	9	0	0	9	2	0	0	0	0	2	56
Hourly Total	1	70	12	0	0	83	3	25	3	1	0	32	7	3	23	0	0	33	5	1	2	0	1	8	156
8:00 AM	0	17	3	1	0	21	1	2	2	0	0	5	2	0	6	0	0	8	0	0	1	0	1	1	35
8:15 AM	1	12	4	0	0	17	2	4	0	0	0	6	2	0	7	0	0	9	0	0	0	0	1	0	32
8:30 AM	1	18	1	0	0	20	0	6	1	0	0	7	1	0	2	0	2	3	0	0	0	0	1	0	30
8:45 AM	0	9	5	0	2	14	4	3	1	1	1	9	3	0	2	0	0	5	0	1	0	0	1	1	29
Hourly Total	2	56	13	1	2	72	7	15	4	1	1	27	8	0	17	0	2	25	0	1	1	0	4	2	126
9:00 AM	0	5	1	0	2	6	2	5	1	0	0	8	1	0	4	0	1	5	0	0	1	0	0	1	20
9:15 AM	0	9	6	1	0	16	0	4	0	0	0	4	2	0	1	0	0	3	0	0	1	0	0	1	24
9:30 AM	2	1	4	0	0	7	1	6	0	0	1	7	0	0	3	0	1	3	1	0	0	0	0	1	18
9:45 AM	0	7	3	0	2	10	0	3	0	0	0	3	1	0	2	0	1	3	0	0	0	0	0	0	16
Hourly Total	2	22	14	1	4	39	3	18	1	0	1	22	4	0	10	0	3	14	1	0	2	0	0	3	78
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	0	5	4	0	0	9	2	8	1	1	0	12	1	0	3	0	1	4	1	0	0	0	0	1	26
3:15 PM	0	11	0	0	1	11	3	12	0	0	0	15	4	0	2	0	1	6	0	0	1	0	0	1	33
3:30 PM	0	7	3	0	0	10	0	12	0	1	0	13	3	1	1	0	2	5	0	0	0	0	0	0	28
3:45 PM	0	7	4	0	3	11	2	5	0	0	0	7	6	1	1	1	4	9	2	0	0	0	0	2	29
Hourly Total	0	30	11	0	4	41	7	37	1	2	0	47	14	2	7	1	8	24	3	0	1	0	0	4	116
4:00 PM	0	9	3	0	0	12	1	10	0	0	0	11	2	1	1	1	0	5	0	0	0	0	0	0	28
4:15 PM	0	4	3	0	3	7	3	10	1	0	0	14	6	1	0	1	0	8	1	1	0	0	0	2	31
4:30 PM	0	9	4	0	0	13	1	10	0	0	0	11	5	1	1	0	0	7	0	0	0	0	0	0	31
4:45 PM	0	8	6	0	0	14	2	9	0	0	0	11	7	0	4	0	2	11	1	0	0	0	0	1	37
Hourly Total	0	30	16	0	3	46	7	39	1	0	0	47	20	3	6	2	2	31	2	1	0	0	0	3	127
5:00 PM	0	10	2	0	0	12	1	10	0	0	2	11	7	2	2	1	0	12	0	3	2	0	0	5	40
5:15 PM	0	9	4	0	1	13	2	7	2	0	0	11	6	1	3	1	1	11	0	1	0	0	1	1	36
5:30 PM	0	12	1	0	1	13	4	9	0	0	0	13	5	0	3	0	0	8	0	1	0	0	0	1	35
5:45 PM	1	9	3	0	0	13	2	11	0	0	0	13	3	0	3	0	0	6	0	0	0	0	0	0	32
Hourly Total	1	40	10	0	2	51	9	37	2	0	2	48	21	3	11	2	1	37	0	5	2	0	1	7	143
Grand Total	6	248	76	2	15	332	36	171	12	4	4	223	74	11	74	5	16	164	11	8	8	0	6	27	746
Approach %	1.8	74.7	22.9	0.6	-	-	16.1	76.7	5.4	1.8	-	-	45.1	6.7	45.1	3.0	-	-	40.7	29.6	29.6	0.0	-	-	-
Total %	0.8	33.2	10.2	0.3	-	44.5	4.8	22.9	1.6	0.5	-	29.9	9.9	1.5	9.9	0.7	-	22.0	1.5	1.1	1.1	0.0	-	3.6	-
Lights	4	237	73	2	-	316	36	158	9	2	-	205	71	11	72	5	-	159	7	8	7	0	-	22	702
% Lights	66.7	95.6	96.1	100.0	-	95.2	100.0	92.4	75.0	50.0	-	91.9	95.9	100.0	97.3	100.0	-	97.0	63.6	100.0	87.5	-	-	81.5	94.1
Mediums	2	10	3	0	-	15	0	11	3	2	-	16	3	0	2	0	-	5	4	0	1	0	-	5	41

% Mediums	33.3	4.0	3.9	0.0	-	4.5	0.0	6.4	25.0	50.0	-	7.2	4.1	0.0	2.7	0.0	-	3.0	36.4	0.0	12.5	-	-	18.5	5.5
Articulated Trucks	0	1	0	0	-	1	0	2	0	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	3
% Articulated Trucks	0.0	0.4	0.0	0.0	-	0.3	0.0	1.2	0.0	0.0	-	0.9	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.4
Pedestrians	-	-	-	-	15	-	-	-	-	-	4	-	-	-	-	-	16	-	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Cole Street
Site Code:
Start Date: 05/26/2016



Turning Movement Data Plot

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Cole Street
Site Code:
Start Date: 05/26/2016

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Nisbet Boulevard Eastbound						Nisbet Boulevard Westbound						Cole Street Northbound						Cole Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:30 AM	0	20	3	0	0	23	2	6	0	0	0	8	2	0	5	0	0	7	0	0	1	0	0	1	39
7:45 AM	1	27	4	0	0	32	0	11	1	1	0	13	0	0	9	0	0	9	2	0	0	0	0	2	56
8:00 AM	0	17	3	1	0	21	1	2	2	0	0	5	2	0	6	0	0	8	0	0	1	0	1	1	35
8:15 AM	1	12	4	0	0	17	2	4	0	0	0	6	2	0	7	0	0	9	0	0	0	0	1	0	32
Total	2	76	14	1	0	93	5	23	3	1	0	32	6	0	27	0	0	33	2	0	2	0	2	4	162
Approach %	2.2	81.7	15.1	1.1	-	-	15.6	71.9	9.4	3.1	-	-	18.2	0.0	81.8	0.0	-	-	50.0	0.0	50.0	0.0	-	-	-
Total %	1.2	46.9	8.6	0.6	-	57.4	3.1	14.2	1.9	0.6	-	19.8	3.7	0.0	16.7	0.0	-	20.4	1.2	0.0	1.2	0.0	-	2.5	-
PHF	0.500	0.704	0.875	0.250	-	0.727	0.625	0.523	0.375	0.250	-	0.615	0.750	0.000	0.750	0.000	-	0.917	0.250	0.000	0.500	0.000	-	0.500	0.723
Lights	2	74	13	1	-	90	5	16	2	0	-	23	5	0	25	0	-	30	2	0	1	0	-	3	146
% Lights	100.0	97.4	92.9	100.0	-	96.8	100.0	69.6	66.7	0.0	-	71.9	83.3	-	92.6	-	-	90.9	100.0	-	50.0	-	-	75.0	90.1
Mediums	0	2	1	0	-	3	0	5	1	1	-	7	1	0	2	0	-	3	0	0	1	0	-	1	14
% Mediums	0.0	2.6	7.1	0.0	-	3.2	0.0	21.7	33.3	100.0	-	21.9	16.7	-	7.4	-	-	9.1	0.0	-	50.0	-	-	25.0	8.6
Articulated Trucks	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	2
% Articulated Trucks	0.0	0.0	0.0	0.0	-	0.0	0.0	8.7	0.0	0.0	-	6.3	0.0	-	0.0	-	-	0.0	0.0	-	0.0	-	-	0.0	1.2
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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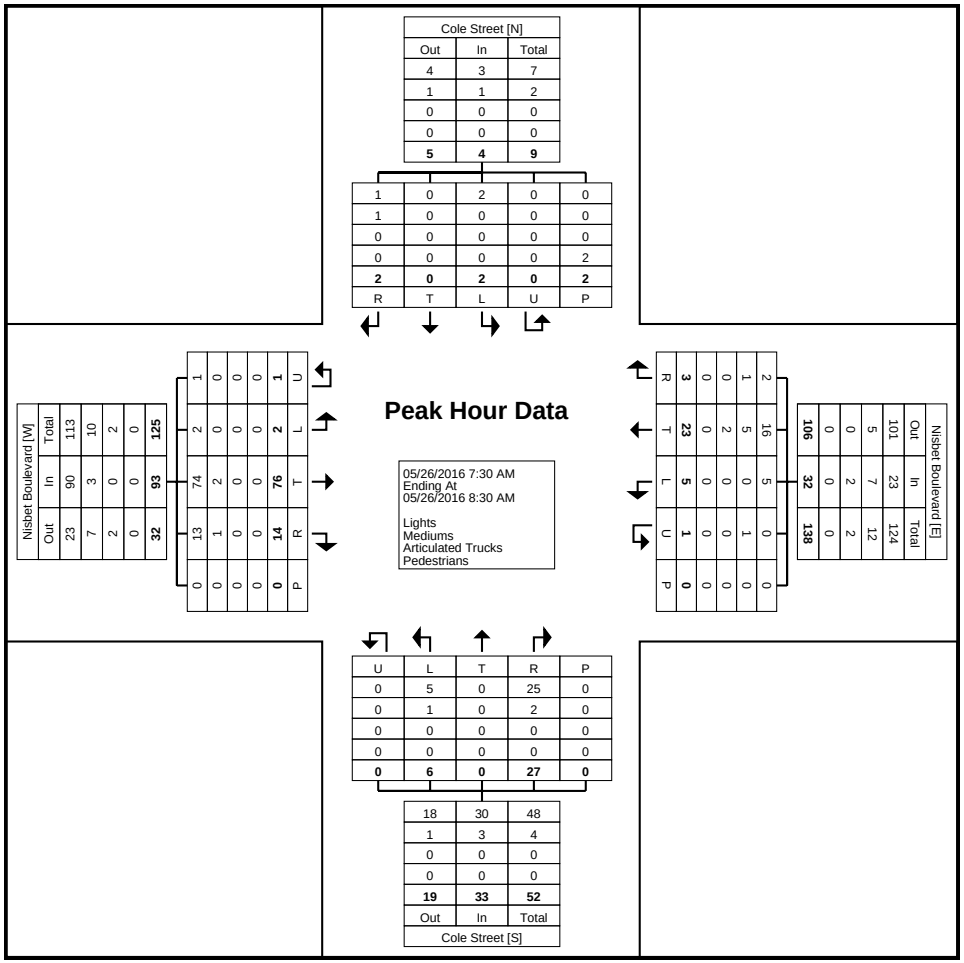

Turning Movement Peak Hour Data Plot (7:30 AM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Cole Street
Site Code:
Start Date: 05/26/2016

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Nisbet Boulevard Eastbound						Nisbet Boulevard Westbound						Cole Street Northbound						Cole Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:45 PM	0	8	6	0	0	14	2	9	0	0	0	11	7	0	4	0	2	11	1	0	0	0	0	1	37
5:00 PM	0	10	2	0	0	12	1	10	0	0	2	11	7	2	2	1	0	12	0	3	2	0	0	5	40
5:15 PM	0	9	4	0	1	13	2	7	2	0	0	11	6	1	3	1	1	11	0	1	0	0	1	1	36
5:30 PM	0	12	1	0	1	13	4	9	0	0	0	13	5	0	3	0	0	8	0	1	0	0	0	1	35
Total	0	39	13	0	2	52	9	35	2	0	2	46	25	3	12	2	3	42	1	5	2	0	1	8	148
Approach %	0.0	75.0	25.0	0.0	-	-	19.6	76.1	4.3	0.0	-	-	59.5	7.1	28.6	4.8	-	-	12.5	62.5	25.0	0.0	-	-	-
Total %	0.0	26.4	8.8	0.0	-	35.1	6.1	23.6	1.4	0.0	-	31.1	16.9	2.0	8.1	1.4	-	28.4	0.7	3.4	1.4	0.0	-	5.4	-
PHF	0.000	0.813	0.542	0.000	-	0.929	0.563	0.875	0.250	0.000	-	0.885	0.893	0.375	0.750	0.500	-	0.875	0.250	0.417	0.250	0.000	-	0.400	0.925
Lights	0	37	13	0	-	50	9	35	2	0	-	46	25	3	12	2	-	42	1	5	2	0	-	8	146
% Lights	-	94.9	100.0	-	-	96.2	100.0	100.0	100.0	-	-	100.0	100.0	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	-	-	100.0	98.6
Mediums	0	2	0	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	2
% Mediums	-	5.1	0.0	-	-	3.8	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	1.4
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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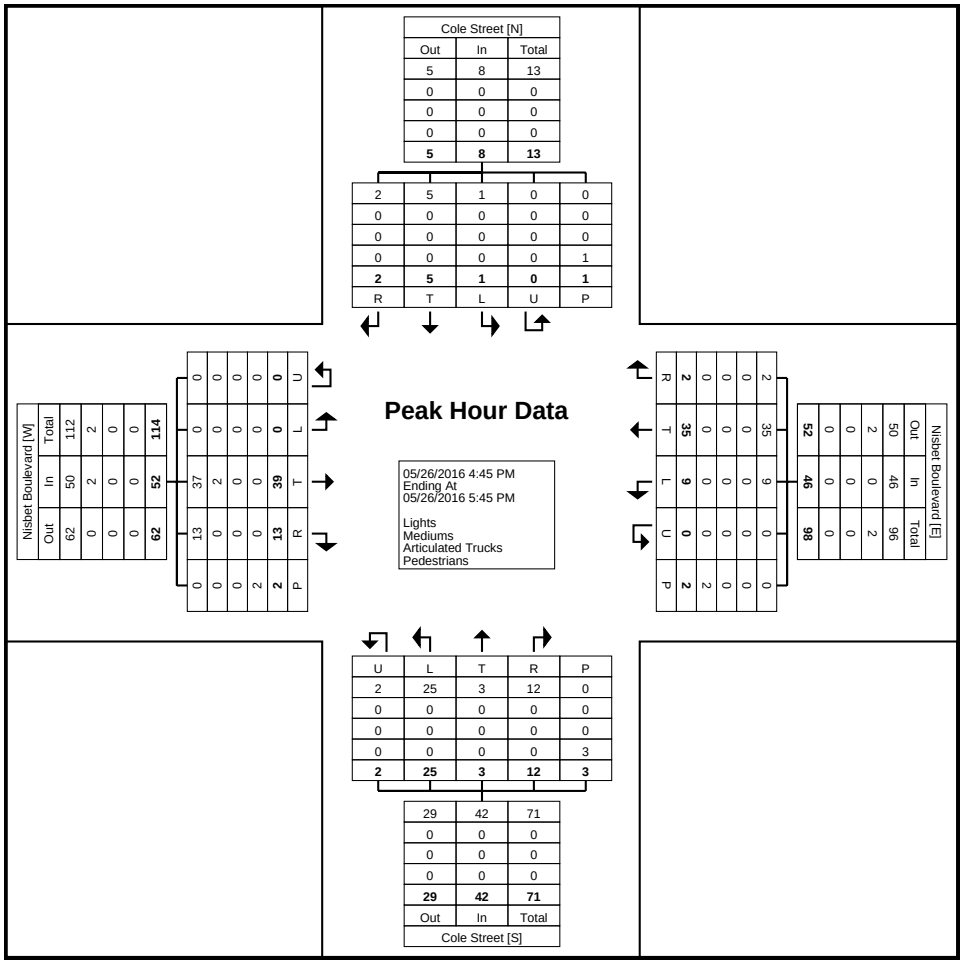
519-896-3163 cbowness@ptsl.com

Count Name: Nisbet Boulevard & Cole Street
Site Code:
Start Date: 05/26/2016



Turning Movement Peak Hour Data Plot (4:45 PM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
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Count Name: Nisbet Boulevard & Cole Street
Site Code:
Start Date: 05/26/2016

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Parkside Drive & Cole Street
Site Code:
Start Date: 05/26/2016

Turning Movement Data

Start Time	Parkside Drive Eastbound					Parkside Drive Westbound					Cole Street Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
7:00 AM	5	122	0	0	127	58	4	0	1	62	7	2	0	0	9	198
7:15 AM	4	155	0	0	159	53	6	0	0	59	5	4	0	0	9	227
7:30 AM	2	167	0	0	169	80	3	0	1	83	5	5	0	0	10	262
7:45 AM	4	164	0	0	168	143	4	0	3	147	7	4	0	0	11	326
Hourly Total	15	608	0	0	623	334	17	0	5	351	24	15	0	0	39	1013
8:00 AM	3	162	0	0	165	119	3	0	6	122	7	2	0	2	9	296
8:15 AM	2	175	0	0	177	89	3	0	12	92	4	6	1	1	11	280
8:30 AM	0	143	0	0	143	82	4	0	0	86	3	1	0	0	4	233
8:45 AM	2	113	0	0	115	105	5	0	7	110	7	12	0	1	19	244
Hourly Total	7	593	0	0	600	395	15	0	25	410	21	21	1	4	43	1053
9:00 AM	3	105	0	0	108	65	1	0	1	66	5	2	0	0	7	181
9:15 AM	0	107	0	1	107	58	3	0	2	61	9	0	0	2	9	177
9:30 AM	2	78	0	0	80	64	3	0	10	67	8	1	0	0	9	156
9:45 AM	2	70	0	0	72	50	2	0	2	52	3	0	0	0	3	127
Hourly Total	7	360	0	1	367	237	9	0	15	246	25	3	0	2	28	641
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	3	87	0	0	90	114	3	0	4	117	3	6	0	0	9	216
3:15 PM	7	80	0	0	87	117	4	0	1	121	1	4	0	0	5	213
3:30 PM	6	114	0	0	120	111	5	0	2	116	4	2	0	0	6	242
3:45 PM	4	101	0	3	105	125	10	0	3	135	3	5	0	3	8	248
Hourly Total	20	382	0	3	402	467	22	0	10	489	11	17	0	3	28	919
4:00 PM	0	126	0	0	126	143	8	0	1	151	7	2	0	0	9	286
4:15 PM	4	115	0	0	119	149	9	0	1	158	5	3	0	0	8	285
4:30 PM	2	106	0	0	108	159	12	0	3	171	4	3	0	0	7	286
4:45 PM	7	124	0	0	131	170	9	0	0	179	3	3	0	0	6	316
Hourly Total	13	471	0	0	484	621	38	0	5	659	19	11	0	0	30	1173
5:00 PM	2	121	0	0	123	176	15	0	2	191	4	7	0	0	11	325
5:15 PM	2	128	0	0	130	188	12	0	0	200	9	1	0	0	10	340
5:30 PM	7	140	0	0	147	182	11	0	1	193	3	3	0	0	6	346
5:45 PM	1	121	1	0	123	153	14	0	1	167	4	1	0	0	5	295
Hourly Total	12	510	1	0	523	699	52	0	4	751	20	12	0	0	32	1306
Grand Total	74	2924	1	4	2999	2753	153	0	64	2906	120	79	1	9	200	6105
Approach %	2.5	97.5	0.0	-	-	94.7	5.3	0.0	-	-	60.0	39.5	0.5	-	-	-
Total %	1.2	47.9	0.0	-	49.1	45.1	2.5	0.0	-	47.6	2.0	1.3	0.0	-	3.3	-
Lights	73	2816	1	-	2890	2620	150	0	-	2770	118	77	0	-	195	5855
% Lights	98.6	96.3	100.0	-	96.4	95.2	98.0	-	-	95.3	98.3	97.5	0.0	-	97.5	95.9

Mediums	1	97	0	-	98	122	3	0	-	125	2	2	1	-	5	228
% Mediums	1.4	3.3	0.0	-	3.3	4.4	2.0	-	-	4.3	1.7	2.5	100.0	-	2.5	3.7
Articulated Trucks	0	11	0	-	11	11	0	0	-	11	0	0	0	-	0	22
% Articulated Trucks	0.0	0.4	0.0	-	0.4	0.4	0.0	-	-	0.4	0.0	0.0	0.0	-	0.0	0.4
Pedestrians	-	-	-	4	-	-	-	-	64	-	-	-	-	9	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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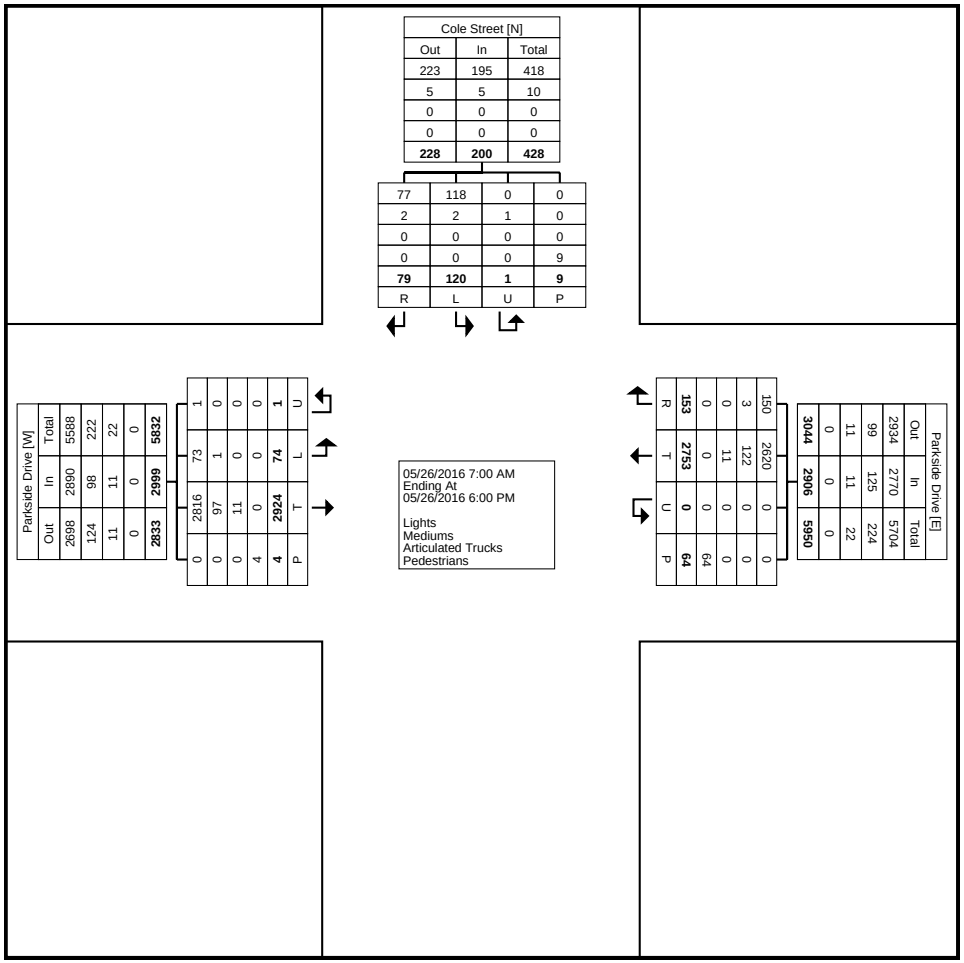

Turning Movement Data Plot

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Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Parkside Drive & Cole Street
Site Code:
Start Date: 05/26/2016

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Parkside Drive Eastbound					Parkside Drive Westbound					Cole Street Southbound					
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	Int. Total
7:30 AM	2	167	0	0	169	80	3	0	1	83	5	5	0	0	10	262
7:45 AM	4	164	0	0	168	143	4	0	3	147	7	4	0	0	11	326
8:00 AM	3	162	0	0	165	119	3	0	6	122	7	2	0	2	9	296
8:15 AM	2	175	0	0	177	89	3	0	12	92	4	6	1	1	11	280
Total	11	668	0	0	679	431	13	0	22	444	23	17	1	3	41	1164
Approach %	1.6	98.4	0.0	-	-	97.1	2.9	0.0	-	-	56.1	41.5	2.4	-	-	-
Total %	0.9	57.4	0.0	-	58.3	37.0	1.1	0.0	-	38.1	2.0	1.5	0.1	-	3.5	-
PHF	0.688	0.954	0.000	-	0.959	0.753	0.813	0.000	-	0.755	0.821	0.708	0.250	-	0.932	0.893
Lights	11	639	0	-	650	394	11	0	-	405	23	16	0	-	39	1094
% Lights	100.0	95.7	-	-	95.7	91.4	84.6	-	-	91.2	100.0	94.1	0.0	-	95.1	94.0
Mediums	0	26	0	-	26	33	2	0	-	35	0	1	1	-	2	63
% Mediums	0.0	3.9	-	-	3.8	7.7	15.4	-	-	7.9	0.0	5.9	100.0	-	4.9	5.4
Articulated Trucks	0	3	0	-	3	4	0	0	-	4	0	0	0	-	0	7
% Articulated Trucks	0.0	0.4	-	-	0.4	0.9	0.0	-	-	0.9	0.0	0.0	0.0	-	0.0	0.6
Pedestrians	-	-	-	0	-	-	-	-	22	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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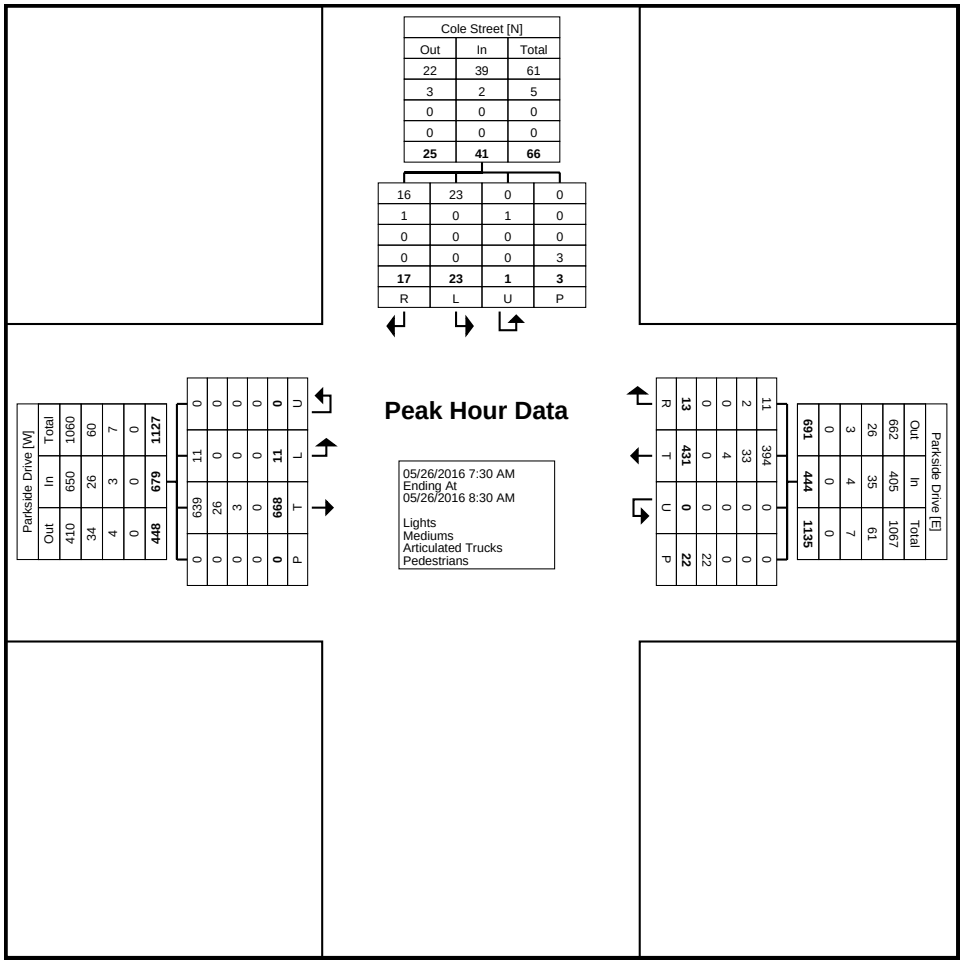

Turning Movement Peak Hour Data Plot (7:30 AM)

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Site Code:
Start Date: 05/26/2016

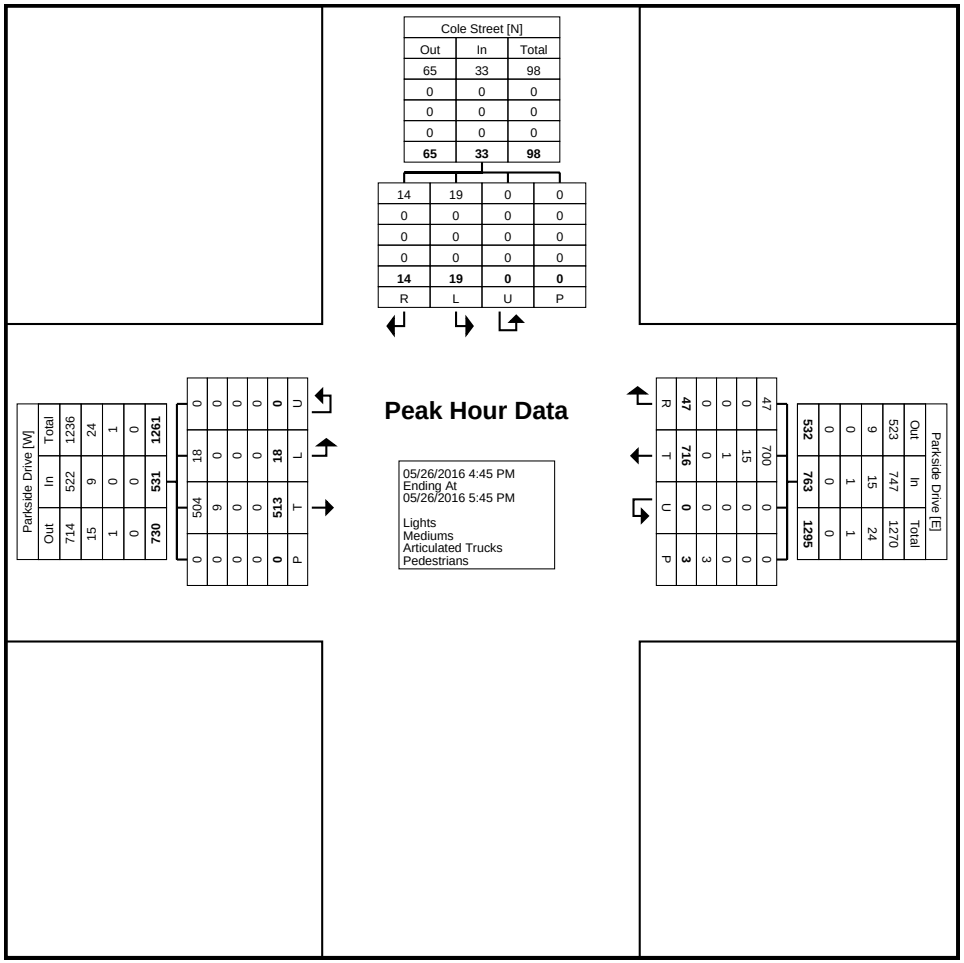
Turning Movement Peak Hour Data (4:45 PM)

Start Time	Parkside Drive Eastbound					Parkside Drive Westbound					Cole Street Southbound					
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	Int. Total
4:45 PM	7	124	0	0	131	170	9	0	0	179	3	3	0	0	6	316
5:00 PM	2	121	0	0	123	176	15	0	2	191	4	7	0	0	11	325
5:15 PM	2	128	0	0	130	188	12	0	0	200	9	1	0	0	10	340
5:30 PM	7	140	0	0	147	182	11	0	1	193	3	3	0	0	6	346
Total	18	513	0	0	531	716	47	0	3	763	19	14	0	0	33	1327
Approach %	3.4	96.6	0.0	-	-	93.8	6.2	0.0	-	-	57.6	42.4	0.0	-	-	-
Total %	1.4	38.7	0.0	-	40.0	54.0	3.5	0.0	-	57.5	1.4	1.1	0.0	-	2.5	-
PHF	0.643	0.916	0.000	-	0.903	0.952	0.783	0.000	-	0.954	0.528	0.500	0.000	-	0.750	0.959
Lights	18	504	0	-	522	700	47	0	-	747	19	14	0	-	33	1302
% Lights	100.0	98.2	-	-	98.3	97.8	100.0	-	-	97.9	100.0	100.0	-	-	100.0	98.1
Mediums	0	9	0	-	9	15	0	0	-	15	0	0	0	-	0	24
% Mediums	0.0	1.8	-	-	1.7	2.1	0.0	-	-	2.0	0.0	0.0	-	-	0.0	1.8
Articulated Trucks	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	-	-	0.0	0.1	0.0	-	-	0.1	0.0	0.0	-	-	0.0	0.1
Pedestrians	-	-	-	0	-	-	-	-	3	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Parkside Drive & Cole Street
Site Code:
Start Date: 05/26/2016



Turning Movement Peak Hour Data Plot (4:45 PM)

Paradigm Transportation Solutions Limited
22 King Street South, Suite 300

Waterloo, Ontario, Canada N2J 1N8
519-896-3163 cbowness@ptsl.com

Count Name: Parkside Drive & Cole Street
Site Code:
Start Date: 05/26/2016

Appendix B

2016 Existing Traffic Operations Reports

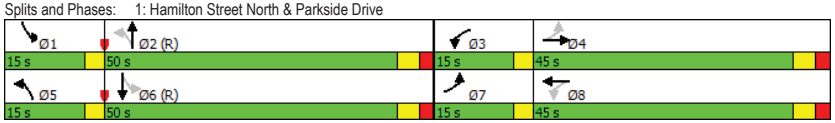
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	407	69	72	185	81	80	192	78	201	244	156
Future Volume (vph)	131	407	69	72	185	81	80	192	78	201	244	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	50.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99			0.99		1.00				0.99	
Frt		0.978			0.954			0.957			0.941	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1774	0	1703	1650	0	1736	1727	0	1736	1661	0
Flt Permitted	0.368			0.138			0.355			0.450		
Satd. Flow (perm)	649	1774	0	247	1650	0	645	1727	0	822	1661	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			18			18			29	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	5		13	13		5	6					6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Adj. Flow (vph)	142	442	75	78	201	88	87	209	85	218	265	170
Shared Lane Traffic (%)												
Lane Group Flow (vph)	142	517	0	78	289	0	87	294	0	218	435	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	15.7		8.0	15.7		8.0	32.7		8.0	30.7	
Total Split (s)	15.0	45.0		15.0	45.0		15.0	50.0		15.0	50.0	
Total Split (%)	12.0%	36.0%		12.0%	36.0%		12.0%	40.0%		12.0%	40.0%	
Maximum Green (s)	12.0	39.3		12.0	39.3		12.0	44.3		12.0	44.3	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		10.0			10.0			10.0			10.0	
Flash Dont Walk (s)		18.0			17.0			17.0			15.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	51.2	39.3		46.9	35.3		61.4	50.0		66.3	52.6	
Actuated g/C Ratio	0.41	0.31		0.38	0.28		0.49	0.40		0.53	0.42	
v/c Ratio	0.40	0.92		0.40	0.60		0.22	0.42		0.42	0.61	
Control Delay	25.4	63.4		26.7	41.1		17.6	29.5		19.7	32.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.4	63.4		26.7	41.1		17.6	29.5		19.7	32.8	
LOS	C	E		C	D		B	C		B	C	
Approach Delay		55.2			38.0			26.8			28.5	
Approach LOS		E			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 125
Actuated Cycle Length: 125
Offset: 56 (45%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 38.4 Intersection LOS: D
Intersection Capacity Utilization 73.9% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	142	517	78	289	87	294	218	435
v/c Ratio	0.40	0.92	0.40	0.60	0.22	0.42	0.42	0.61
Control Delay	25.4	63.4	26.7	41.1	17.6	29.5	19.7	32.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.4	63.4	26.7	41.1	17.6	29.5	19.7	32.8
Queue Length 50th (m)	21.4	122.1	11.3	57.7	11.6	55.0	31.6	86.9
Queue Length 95th (m)	35.2	#193.7	21.0	87.5	21.1	82.6	48.4	130.4
Internal Link Dist (m)		191.8		134.9		206.2		208.7
Turn Bay Length (m)	40.0		50.0		40.0		40.0	
Base Capacity (vph)	366	579	238	532	438	701	524	715
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.39	0.89	0.33	0.54	0.20	0.42	0.42	0.61

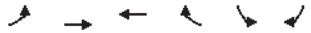
Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	131	407	69	72	185	81	80	192	78	201	244	156
Future Volume (vph)	131	407	69	72	185	81	80	192	78	201	244	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.95		1.00	0.96		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1684	1775		1702	1651		1732	1726		1736	1662	
Flt Permitted	0.37	1.00		0.14	1.00		0.36	1.00		0.45	1.00	
Satd. Flow (perm)	652	1775		247	1651		648	1726		822	1662	
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)	142	442	75	78	201	88	87	209	85	218	265	170
RTOR Reduction (vph)	0	5	0	0	13	0	0	11	0	0	17	0
Lane Group Flow (vph)	142	512	0	78	276	0	87	283	0	218	418	0
Confl. Peds. (#/hr)	5		13	13		5	6					6
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	49.9	39.3		43.5	35.9		58.1	49.4		63.3	52.0	
Effective Green, g (s)	49.9	39.3		43.5	35.9		58.1	49.4		63.3	52.0	
Actuated g/C Ratio	0.40	0.31		0.35	0.29		0.46	0.40		0.51	0.42	
Clearance Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	351	558		174	474		376	682		498	691	
v/s Ratio Prot	c0.04	c0.29		c0.03	0.17		0.02	0.16		c0.04	c0.25	
v/s Ratio Perm	0.13			0.13			0.09			0.18		
v/c Ratio	0.40	0.92		0.45	0.58		0.23	0.42		0.44	0.61	
Uniform Delay, d1	25.6	41.3		30.7	38.1		19.8	27.3		18.1	28.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	20.0		1.8	1.8		0.3	1.9		0.6	3.9	
Delay (s)	26.4	61.3		32.5	40.0		20.2	29.2		18.7	32.4	
Level of Service	C	E		C	D		C	C		B	C	
Approach Delay (s)		53.8			38.4			27.1			27.8	
Approach LOS		D			D			C			C	

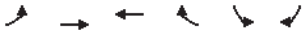
Intersection Summary				
HCM 2000 Control Delay	37.9	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	125.0	Sum of lost time (s)	17.4	
Intersection Capacity Utilization	73.9%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	11	668	431	13	23	17
Future Volume (vph)	11	668	431	13	23	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0			0.0	0.0	0.0
Storage Lanes	1			0	1	0
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.996		0.943	
Flt Protected	0.950				0.972	
Satd. Flow (prot)	1805	1827	1733	0	1699	0
Flt Permitted	0.950				0.972	
Satd. Flow (perm)	1805	1827	1733	0	1699	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		109.3	215.8		266.4	
Travel Time (s)		7.9	15.5		19.2	
Confl. Peds. (#/hr)	3			3	22	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	9%	15%	0%	6%
Adj. Flow (vph)	12	726	468	14	25	18
Shared Lane Traffic (%)						
Lane Group Flow (vph)	12	726	482	0	43	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

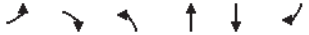
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	668	431	13	23	17
Future Volume (Veh/h)	11	668	431	13	23	17
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	726	468	14	25	18
Pedestrians			22		3	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			2		0	
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (m)			216			
pX, platoon unblocked	0.92				0.92	0.92
vC, conflicting volume	485				1250	478
vC1, stage 1 conf vol					478	
vC2, stage 2 conf vol					772	
vCu, unblocked vol	401				1229	393
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.4
p0 queue free %	99				94	97
cM capacity (veh/h)	1077				388	596

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	12	726	482	43
Volume Left	12	0	0	25
Volume Right	0	0	14	18
cSH	1077	1700	1700	454
Volume to Capacity	0.01	0.43	0.28	0.09
Queue Length 95th (m)	0.3	0.0	0.0	2.5
Control Delay (s)	8.4	0.0	0.0	13.7
Lane LOS	A			B
Approach Delay (s)	0.1		0.0	13.7
Approach LOS				B

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	45	87	15	380	533	19
Future Volume (vph)	45	87	15	380	533	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0	0.0	35.0			0.0
Storage Lanes	1	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850			0.995	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1568	1805	1792	1787	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1770	1568	1805	1792	1787	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	182.9			232.7	112.0	
Travel Time (s)	13.2			16.8	8.1	
Confl. Peds. (#/hr)	2	1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	0%	6%	6%	0%
Adj. Flow (vph)	49	95	16	413	579	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	49	95	16	413	600	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	45	87	15	380	533	19
Future Volume (Veh/h)	45	87	15	380	533	19
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	49	95	16	413	579	21
Pedestrians				1	2	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				233		
pX, platoon unblocked	0.93					
vC, conflicting volume	1036	590	600			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	999	590	600			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	81	98			
cM capacity (veh/h)	245	505	987			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	49	95	16	413	600
Volume Left	49	0	16	0	0
Volume Right	0	95	0	0	21
cSH	245	505	987	1700	1700
Volume to Capacity	0.20	0.19	0.02	0.24	0.35
Queue Length 95th (m)	5.8	5.5	0.4	0.0	0.0
Control Delay (s)	23.3	13.8	8.7	0.0	0.0
Lane LOS	C	B	A		
Approach Delay (s)	17.0		0.3		0.0
Approach LOS	C				

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	41.6%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	100	0	4	30	0	32
Future Volume (vph)	100	0	4	30	0	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.995		
Satd. Flow (prot)	1845	0	0	1491	1644	0
Flt Permitted				0.995		
Satd. Flow (perm)	1845	0	0	1491	1644	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	70.4			182.9	103.7	
Travel Time (s)	5.1			13.2	7.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	0%	0%	30%	0%	0%
Adj. Flow (vph)	109	0	4	33	0	35
Shared Lane Traffic (%)						
Lane Group Flow (vph)	109	0	0	37	35	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	15.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	100	0	4	30	0	32
Future Volume (Veh/h)	100	0	4	30	0	32
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	109	0	4	33	0	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			109		150	109
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			109		150	109
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	96
cM capacity (veh/h)			1494		844	950

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	109	37	35
Volume Left	0	4	0
Volume Right	0	0	35
cSH	1700	1494	950
Volume to Capacity	0.06	0.00	0.04
Queue Length 95th (m)	0.0	0.1	0.9
Control Delay (s)	0.0	0.8	8.9
Lane LOS		A	A
Approach Delay (s)	0.0	0.8	8.9
Approach LOS			A

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	15.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	74	12	3	23	4	5	0	24	2	0	0
Future Volume (vph)	3	74	12	3	23	4	5	0	24	2	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.982			0.983			0.887				
Flt Protected		0.998			0.995			0.992			0.950	
Satd. Flow (prot)	0	1798	0	0	1468	0	0	1620	0	0	1671	0
Flt Permitted		0.998			0.995			0.992			0.950	
Satd. Flow (perm)	0	1798	0	0	1468	0	0	1620	0	0	1671	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		145.2			70.4			266.4			79.7	
Travel Time (s)		10.5			5.1			19.2			5.7	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	3%	8%	0%	30%	25%	20%	0%	0%	8%	0%	0%
Adj. Flow (vph)	3	80	13	3	25	4	5	0	26	2	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	96	0	0	32	0	0	31	0	0	2	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization	15.8%	ICU Level of Service A	
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	3	74	12	3	23	4	5	0	24	2	0	0
Future Volume (veh/h)	3	74	12	3	23	4	5	0	24	2	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	80	13	3	25	4	5	0	26	2	0	0
Approach Volume (veh/h)		96			32			31			2	
Crossing Volume (veh/h)		5			8			85			33	
High Capacity (veh/h)		1379			1376			1296			1349	
High v/c (veh/h)		0.07			0.02			0.02			0.00	
Low Capacity (veh/h)		1156			1153			1080			1129	
Low v/c (veh/h)		0.08			0.03			0.03			0.00	

Intersection Summary					
Maximum v/c High		0.07			
Maximum v/c Low		0.08			
Intersection Capacity Utilization		15.8%	ICU Level of Service	A	

Junctions 8

ARCADY 8 - Roundabout Module

Filename: Nisbet & Cole.arc8
Path: C:\Users\Matt\Documents\Paradigm\Projects\Arcady Projects\160860 UCO Property
Report generation date: 30/06/2016 9:59:19 AM

Summary of intersection performance

	AM						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	2016						
Leg North	0.00	~1	0.00	0.00	A	3.18	A
Leg West	0.09	~1	3.20	0.08	A		
Leg South	0.03	~1	3.14	0.03	A		
Leg East	0.03	~1	3.15	0.03	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - 2016, AM " model duration: 8:00 AM - 9:30 AM
"D2 - 2016, PM" model duration: 4:00 PM - 5:30 PM
"D3 - 2021 Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - 2021 Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - 2021 Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - 2021 Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 30/06/2016 9:59:17 AM

File summary

Title	Nisbet & Cole
Location	Waterdown
Site Number	
Date	30/06/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	160860
Analyst	Matt
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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

2016, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2016, AM	2016	AM		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	untitled	Roundabout	North,West,South,East			3.18	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Cole Street SB	
West	West	Nisbet Boulevard EB	
South	South	Cole Street NB	
East	East	Nisbet Boulevard WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

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
North	3.50	4.50	5.00	15.00	30.00	25.00	

West	3.50	4.50	5.00	15.00	30.00	25.00	
South	3.50	4.50	5.00	15.00	30.00	25.00	
East	3.50	4.50	5.00	15.00	30.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.565	1246.564
West		(calculated)	(calculated)	0.565	1246.564
South		(calculated)	(calculated)	0.565	1246.564
East		(calculated)	(calculated)	0.565	1246.564

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

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	2.00	100.000
West	ONE HOUR	✓	89.00	100.000
South	ONE HOUR	✓	29.00	100.000
East	ONE HOUR	✓	30.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	0.000	0.000	2.000
	West	3.000	0.000	12.000	74.000
	South	0.000	5.000	0.000	24.000
	East	4.000	23.000	3.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.00	0.00	1.00
	West	0.03	0.00	0.13	0.83
	South	0.00	0.17	0.00	0.83
	East	0.13	0.77	0.10	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.000	1.000
	West	1.000	1.000	1.010	1.020
	South	1.000	1.010	1.000	1.020
	East	1.010	1.070	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	0.0	0.0
	West	0.0	0.0	1.0	2.0
	South	0.0	1.0	0.0	2.0
	East	1.0	7.0	0.0	0.0

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
North	0.00	0.00	0.00	~1	A
West	0.08	3.20	0.09	~1	A
South	0.03	3.14	0.03	~1	A
East	0.03	3.15	0.03	~1	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	0.00	0.00	23.26	0.00	1232.71	0.000	0.00	0.000	A
West	67.00	66.77	2.25	0.00	1223.30	0.055	0.06	3.112	A
South	21.83	21.76	57.77	0.00	1191.49	0.018	0.02	3.077	A
East	22.59	22.51	6.00	0.00	1178.34	0.019	0.02	3.114	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	0.00	0.00	27.85	0.00	1229.97	0.000	0.00	0.000	A
West	80.01	79.96	2.70	0.00	1223.05	0.065	0.07	3.148	A
South	26.07	26.06	69.18	0.00	1185.03	0.022	0.02	3.105	A
East	26.97	26.95	7.19	0.00	1177.70	0.023	0.02	3.127	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	0.00	0.00	34.11	0.00	1226.24	0.000	0.00	0.000	A
West	97.99	97.92	3.30	0.00	1222.71	0.080	0.09	3.200	A
South	31.93	31.91	84.72	0.00	1176.24	0.027	0.03	3.145	A
East	33.03	33.01	8.80	0.00	1176.83	0.028	0.03	3.146	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	0.00	0.00	34.13	0.00	1226.23	0.000	0.00	0.000	A
West	97.99	97.99	3.30	0.00	1222.71	0.080	0.09	3.200	A
South	31.93	31.93	84.78	0.00	1176.21	0.027	0.03	3.145	A
East	33.03	33.03	8.81	0.00	1176.83	0.028	0.03	3.146	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	0.00	0.00	27.89	0.00	1229.95	0.000	0.00	0.000	A
West	80.01	80.08	2.70	0.00	1223.05	0.065	0.07	3.149	A
South	26.07	26.09	69.28	0.00	1184.98	0.022	0.02	3.108	A
East	26.97	26.99	7.20	0.00	1177.70	0.023	0.02	3.130	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	0.00	0.00	23.35	0.00	1232.65	0.000	0.00	0.000	A
West	67.00	67.05	2.26	0.00	1223.29	0.055	0.06	3.112	A
South	21.83	21.85	58.01	0.00	1191.35	0.018	0.02	3.079	A
East	22.59	22.60	6.03	0.00	1178.33	0.019	0.02	3.116	A

Queue Variation Results for each time segment

Queue Variation results: (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
North	0.00	~1	~1	~1	~1			N/A	N/A
West	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.00	~1	~1	~1	~1			N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.00	~1	~1	~1	~1			N/A	N/A
West	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.00	~1	~1	~1	~1			N/A	N/A
West	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

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
North	0.00	~1	~1	~1	~1			N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

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
North	0.00	~1	~1	~1	~1			N/A	N/A
West	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

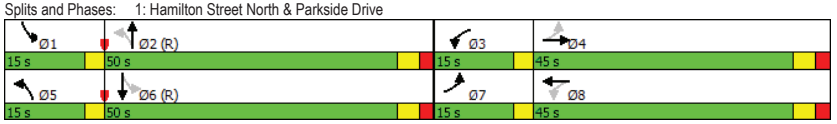
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	128	305	110	232	470	100	137	317	88	135	320	109
Future Volume (vph)	128	305	110	232	470	100	137	317	88	135	320	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	50.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	0.99			0.99		1.00	0.99	
Frt		0.960			0.974			0.967			0.962	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1779	0	1805	1791	0	1752	1799	0	1770	1775	0
Flt Permitted	0.102			0.202			0.256			0.286		
Satd. Flow (perm)	190	1779	0	381	1791	0	472	1799	0	531	1775	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			9			12			15	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	4		9	9		4	6		4	4		6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Adj. Flow (vph)	139	332	120	252	511	109	149	345	96	147	348	118
Shared Lane Traffic (%)												
Lane Group Flow (vph)	139	452	0	252	620	0	149	441	0	147	466	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	15.7		8.0	15.7		8.0	32.7		8.0	30.7	
Total Split (s)	15.0	45.0		15.0	45.0		15.0	50.0		15.0	50.0	
Total Split (%)	12.0%	36.0%		12.0%	36.0%		12.0%	40.0%		12.0%	40.0%	
Maximum Green (s)	12.0	39.3		12.0	39.3		12.0	44.3		12.0	44.3	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		10.0			10.0			7.0			7.0	
Flash Dont Walk (s)		18.0			17.0			17.0			15.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	52.9	39.3		55.0	40.4		59.1	45.8		58.9	45.7	
Actuated g/C Ratio	0.42	0.31		0.44	0.32		0.47	0.37		0.47	0.37	
v/c Ratio	0.64	0.79		0.83	1.06		0.45	0.66		0.42	0.71	
Control Delay	36.5	49.5		46.5	94.5		22.0	38.3		21.2	40.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	36.5	49.5		46.5	94.5		22.0	38.3		21.2	40.2	
LOS	D	D		D	F		C	D		C	D	
Approach Delay		46.4			80.6			34.2			35.7	
Approach LOS		D			F			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 125
Actuated Cycle Length: 125
Offset: 56 (45%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 52.4 Intersection LOS: D
Intersection Capacity Utilization 85.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	139	452	252	620	149	441	147	466
v/c Ratio	0.64	0.79	0.83	1.06	0.45	0.66	0.42	0.71
Control Delay	36.5	49.5	46.5	94.5	22.0	38.3	21.2	40.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.5	49.5	46.5	94.5	22.0	38.3	21.2	40.2
Queue Length 50th (m)	20.8	103.6	40.4	~177.6	20.6	93.2	20.4	100.3
Queue Length 95th (m)	39.2	#149.4	#73.1	#253.5	33.7	132.9	33.3	143.0
Internal Link Dist (m)		191.8		134.9		206.2		208.7
Turn Bay Length (m)	40.0		50.0		40.0		40.0	
Base Capacity (vph)	233	569	304	585	350	666	374	658
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.79	0.83	1.06	0.43	0.66	0.39	0.71

Intersection Summary

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

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	128	305	110	232	470	100	137	317	88	135	320	109
Future Volume (vph)	128	305	110	232	470	100	137	317	88	135	320	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	0.97		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1779		1803	1790		1752	1800		1768	1775	
Flt Permitted	0.10	1.00		0.20	1.00		0.26	1.00		0.29	1.00	
Satd. Flow (perm)	190	1779		384	1790		473	1800		533	1775	
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)	139	332	120	252	511	109	149	345	96	147	348	118
RTOR Reduction (vph)	0	10	0	0	6	0	0	8	0	0	10	0
Lane Group Flow (vph)	139	442	0	252	614	0	149	433	0	147	456	0
Confl. Peds. (#/hr)	4		9	9		4	6		4	4		6
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	50.2	39.3		52.4	40.4		56.4	45.8		56.2	45.7	
Effective Green, g (s)	50.2	39.3		52.4	40.4		56.4	45.8		56.2	45.7	
Actuated g/C Ratio	0.40	0.31		0.42	0.32		0.45	0.37		0.45	0.37	
Clearance Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	214	559		297	578		321	659		343	648	
v/s Ratio Prot	0.06	0.25		c0.08	c0.34		c0.04	0.24		0.04	c0.26	
v/s Ratio Perm	0.20			0.27			0.17			0.16		
v/c Ratio	0.65	0.79		0.85	1.06		0.46	0.66		0.43	0.70	
Uniform Delay, d1	29.7	39.1		27.7	42.3		22.9	33.1		22.5	33.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.6	7.5		19.6	55.0		1.1	5.1		0.9	6.3	
Delay (s)	36.3	46.6		47.3	97.3		24.0	38.1		23.4	40.2	
Level of Service	D	D		D	F		C	D		C	D	
Approach Delay (s)		44.2			82.9			34.6			36.2	
Approach LOS		D			F			C			D	

Intersection Summary					
HCM 2000 Control Delay	52.9	HCM 2000 Level of Service		D	
HCM 2000 Volume to Capacity ratio	0.84				
Actuated Cycle Length (s)	125.0	Sum of lost time (s)		17.4	
Intersection Capacity Utilization	85.4%	ICU Level of Service		E	
Analysis Period (min)	15				

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	18	513	716	47	19	14
Future Volume (vph)	18	513	716	47	19	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0			0.0	0.0	0.0
Storage Lanes	1			0	1	0
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.992		0.944	
Flt Protected	0.950				0.972	
Satd. Flow (prot)	1805	1863	1850	0	1743	0
Flt Permitted	0.950				0.972	
Satd. Flow (perm)	1805	1863	1850	0	1743	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		109.3	215.8		266.4	
Travel Time (s)		7.9	15.5		19.2	
Confl. Peds. (#/hr)					3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%
Adj. Flow (vph)	20	558	778	51	21	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	20	558	829	0	36	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

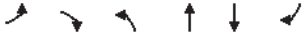
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	18	513	716	47	19	14
Future Volume (Veh/h)	18	513	716	47	19	14
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	558	778	51	21	15
Pedestrians			3			
Lane Width (m)			3.6			
Walking Speed (m/s)			1.2			
Percent Blockage			0			
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (m)			216			
pX, platoon unblocked	0.66				0.66	0.66
vC, conflicting volume	829				1404	804
vC1, stage 1 conf vol					804	
vC2, stage 2 conf vol					601	
vCu, unblocked vol	481				1355	442
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	97				94	96
cM capacity (veh/h)	719				342	408

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	20	558	829	36
Volume Left	20	0	0	21
Volume Right	0	0	51	15
cSH	719	1700	1700	367
Volume to Capacity	0.03	0.33	0.49	0.10
Queue Length 95th (m)	0.7	0.0	0.0	2.6
Control Delay (s)	10.1	0.0	0.0	15.9
Lane LOS	B			C
Approach Delay (s)	0.4		0.0	15.9
Approach LOS				C

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	17	35	44	533	479	24
Future Volume (vph)	17	35	44	533	479	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0	0.0	35.0			0.0
Storage Lanes	1	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.994	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	1881	1871	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1805	1615	1805	1881	1871	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	182.9			232.7	112.0	
Travel Time (s)	13.2			16.8	8.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	18	38	48	579	521	26
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	38	48	579	547	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	35	44	533	479	24
Future Volume (Veh/h)	17	35	44	533	479	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	38	48	579	521	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				233		
pX, platoon unblocked	0.81					
vC, conflicting volume	1209	534	547			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1142	534	547			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	93	95			
cM capacity (veh/h)	173	550	1033			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	18	38	48	579	547
Volume Left	18	0	48	0	0
Volume Right	0	38	0	0	26
cSH	173	550	1033	1700	1700
Volume to Capacity	0.10	0.07	0.05	0.34	0.32
Queue Length 95th (m)	2.7	1.8	1.2	0.0	0.0
Control Delay (s)	28.2	12.0	8.7	0.0	0.0
Lane LOS	D	B	A		
Approach Delay (s)	17.2		0.7		0.0
Approach LOS	C				

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	43.3%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	51	0	20	48	0	1
Future Volume (vph)	51	0	20	48	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.985		
Satd. Flow (prot)	1810	0	0	1872	1644	0
Flt Permitted				0.985		
Satd. Flow (perm)	1810	0	0	1872	1644	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	70.4			182.9	103.7	
Travel Time (s)	5.1			13.2	7.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	0%	0%	0%	0%	0%
Adj. Flow (vph)	55	0	22	52	0	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	55	0	0	74	1	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	51	0	20	48	0	1
Future Volume (Veh/h)	51	0	20	48	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	0	22	52	0	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			55		151	55
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			55		151	55
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1563		834	1018

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	55	74	1
Volume Left	0	22	0
Volume Right	0	0	1
cSH	1700	1563	1018
Volume to Capacity	0.03	0.01	0.00
Queue Length 95th (m)	0.0	0.3	0.0
Control Delay (s)	0.0	2.3	8.5
Lane LOS		A	A
Approach Delay (s)	0.0	2.3	8.5
Approach LOS			A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	40	10	9	37	2	21	3	11	0	5	2
Future Volume (vph)	1	40	10	9	37	2	21	3	11	0	5	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.973			0.995			0.957			0.961	
Flt Protected		0.999			0.990			0.971				
Satd. Flow (prot)	0	1777	0	0	1872	0	0	1766	0	0	1826	0
Flt Permitted		0.999			0.990			0.971				
Satd. Flow (perm)	0	1777	0	0	1872	0	0	1766	0	0	1826	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		145.2			70.4			266.4			79.7	
Travel Time (s)		10.5			5.1			19.2			5.7	
Confl. Peds. (#/hr)	1		3	3		1	2		2	2		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	43	11	10	40	2	23	3	12	0	5	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	55	0	0	52	0	0	38	0	0	7	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization	23.2%	ICU Level of Service A	
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	1	40	10	9	37	2	21	3	11	0	5	2
Future Volume (veh/h)	1	40	10	9	37	2	21	3	11	0	5	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	43	11	10	40	2	23	3	12	0	5	2
Approach Volume (veh/h)		55			52			38			7	
Crossing Volume (veh/h)		15			27			44			73	
High Capacity (veh/h)		1369			1356			1338			1308	
High v/c (veh/h)		0.04			0.04			0.03			0.01	
Low Capacity (veh/h)		1147			1135			1119			1091	
Low v/c (veh/h)		0.05			0.05			0.03			0.01	

Intersection Summary					
Maximum v/c High		0.04			
Maximum v/c Low		0.05			
Intersection Capacity Utilization		23.2%	ICU Level of Service		A

Junctions 8

ARCADY 8 - Roundabout Module

Filename: Nisbet & Cole.arc8
Path: C:\Users\Matt\Documents\Paradigm\Projects\Arcady Projects\160860 UCO Property
Report generation date: 30/06/2016 10:00:17 AM

Summary of intersection performance

	PM						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	2016						
Leg North	0.01	~1	3.01	0.01	A	3.09	A
Leg West	0.05	~1	3.17	0.05	A		
Leg South	0.03	~1	3.05	0.03	A		
Leg East	0.04	~1	3.05	0.04	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - 2016, AM" model duration: 8:00 AM - 9:30 AM
"D2 - 2016, PM " model duration: 4:00 PM - 5:30 PM
"D3 - 2021 Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - 2021 Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - 2021 Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - 2021 Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 30/06/2016 10:00:17 AM

File summary

Title	Nisbet & Cole
Location	Waterdown
Site Number	
Date	30/06/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	160860
Analyst	Matt
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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

2016, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2016, PM	2016	PM		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	untitled	Roundabout	North,West,South,East			3.09	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Cole Street SB	
West	West	Nisbet Boulevard EB	
South	South	Cole Street NB	
East	East	Nisbet Boulevard WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

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
North	3.50	4.50	5.00	15.00	30.00	25.00	

West	3.50	4.50	5.00	15.00	30.00	25.00	
South	3.50	4.50	5.00	15.00	30.00	25.00	
East	3.50	4.50	5.00	15.00	30.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.565	1246.564
West		(calculated)	(calculated)	0.565	1246.564
South		(calculated)	(calculated)	0.565	1246.564
East		(calculated)	(calculated)	0.565	1246.564

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

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	7.00	100.000
West	ONE HOUR	✓	51.00	100.000
South	ONE HOUR	✓	35.00	100.000
East	ONE HOUR	✓	48.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	2.000	5.000	0.000
	West	1.000	0.000	10.000	40.000
	South	3.000	21.000	0.000	11.000
	East	2.000	37.000	9.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.29	0.71	0.00
	West	0.02	0.00	0.20	0.78
	South	0.09	0.60	0.00	0.31
	East	0.04	0.77	0.19	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.000	1.000
	West	1.000	1.000	1.000	1.050
	South	1.000	1.000	1.000	1.000
	East	1.000	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	0.0	0.0
	West	0.0	0.0	0.0	5.0
	South	0.0	0.0	0.0	0.0
	East	0.0	0.0	0.0	0.0

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
North	0.01	3.01	0.01	~1	A
West	0.05	3.17	0.05	~1	A
South	0.03	3.05	0.03	~1	A
East	0.04	3.05	0.04	~1	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	5.27	5.25	50.27	0.00	1218.14	0.004	0.00	2.967	A
West	38.40	38.26	10.51	0.00	1193.80	0.032	0.03	3.115	A
South	26.35	26.26	30.76	0.00	1228.32	0.021	0.02	2.994	A
East	36.14	36.02	18.76	0.00	1235.96	0.029	0.03	2.999	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	6.29	6.29	60.20	0.00	1212.53	0.005	0.01	2.983	A
West	45.85	45.82	12.58	0.00	1192.67	0.038	0.04	3.138	A
South	31.46	31.45	36.84	0.00	1224.72	0.026	0.03	3.016	A
East	43.15	43.13	22.46	0.00	1233.86	0.035	0.04	3.022	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	7.71	7.70	73.72	0.00	1204.88	0.006	0.01	3.006	A
West	56.15	56.11	15.40	0.00	1191.14	0.047	0.05	3.171	A
South	38.54	38.51	45.11	0.00	1219.81	0.032	0.03	3.046	A
East	52.85	52.81	27.51	0.00	1231.01	0.043	0.04	3.054	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	7.71	7.71	73.77	0.00	1204.85	0.006	0.01	3.006	A
West	56.15	56.15	15.41	0.00	1191.13	0.047	0.05	3.171	A
South	38.54	38.54	45.14	0.00	1219.79	0.032	0.03	3.046	A
East	52.85	52.85	27.53	0.00	1231.00	0.043	0.04	3.054	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	6.29	6.30	60.28	0.00	1212.48	0.005	0.01	2.983	A
West	45.85	45.88	12.60	0.00	1192.67	0.038	0.04	3.138	A
South	31.46	31.49	36.89	0.00	1224.69	0.026	0.03	3.018	A
East	43.15	43.18	22.49	0.00	1233.85	0.035	0.04	3.025	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	5.27	5.27	50.48	0.00	1218.02	0.004	0.00	2.970	A
West	38.40	38.42	10.55	0.00	1193.78	0.032	0.03	3.117	A
South	26.35	26.37	30.89	0.00	1228.25	0.021	0.02	2.994	A
East	36.14	36.16	18.83	0.00	1235.91	0.029	0.03	3.002	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

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
North	0.00	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

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
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

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
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

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
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

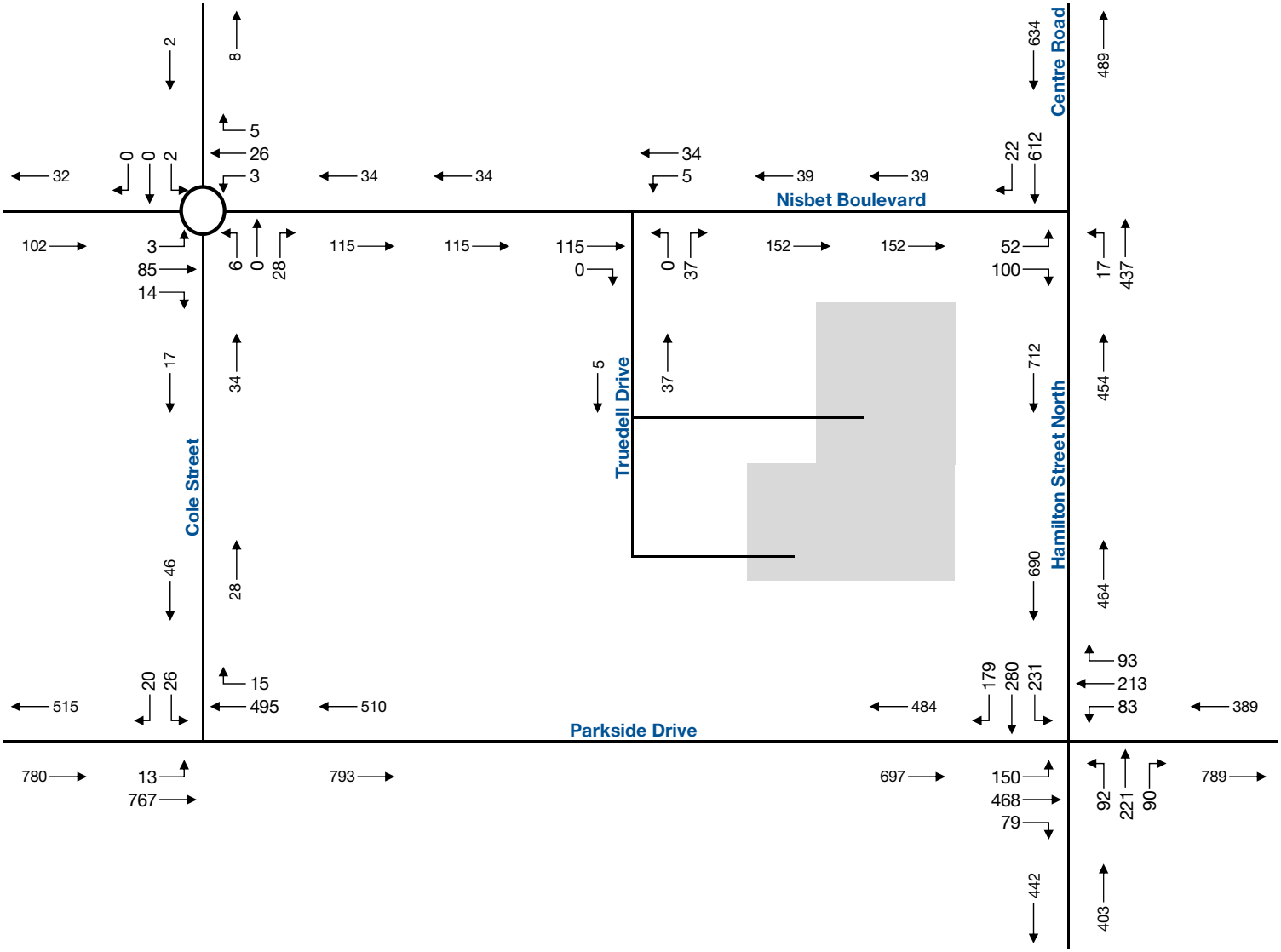
Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

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
North	0.00	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Appendix C

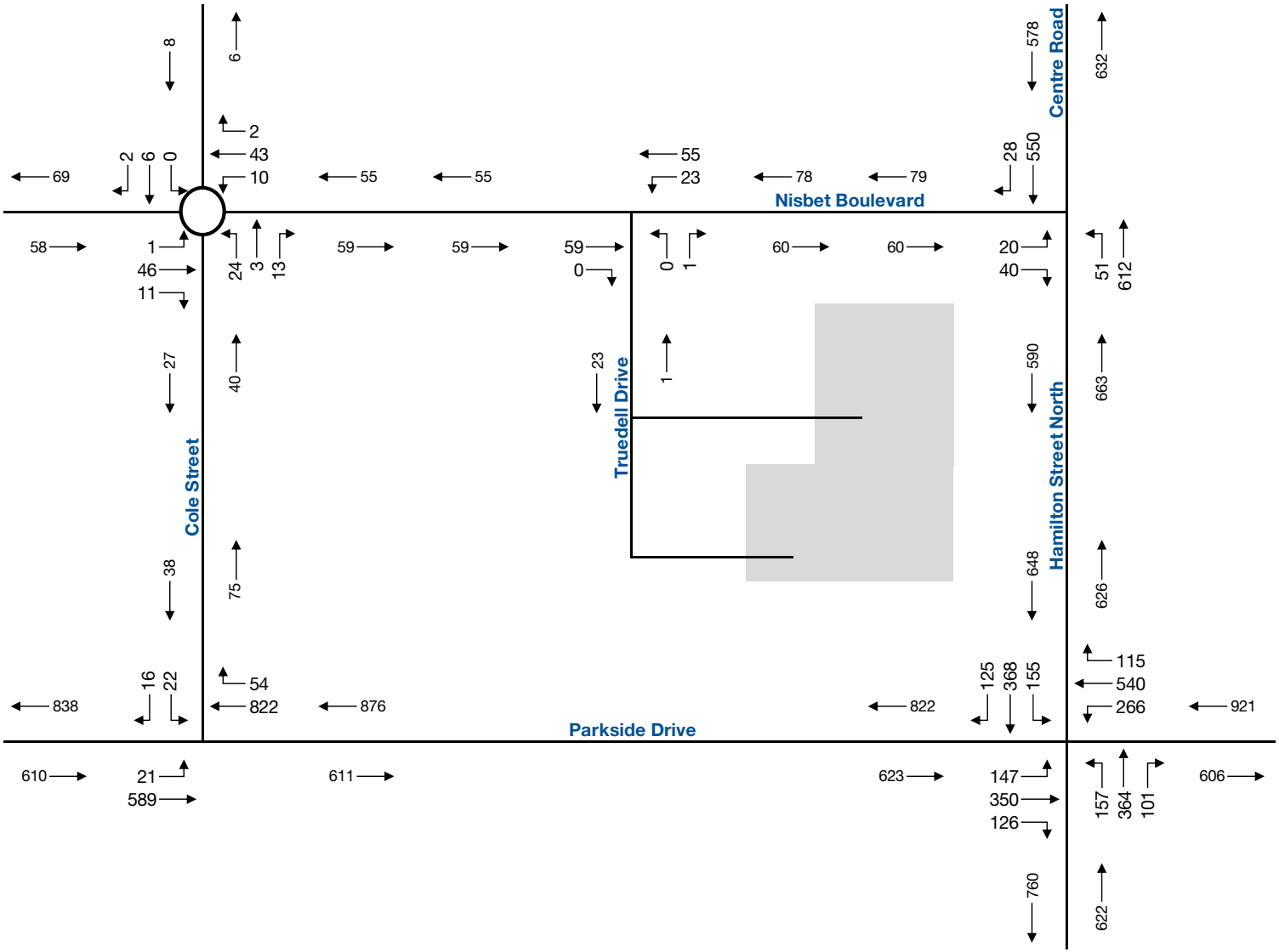
2023 Background Traffic Growth and Reassignment



2023 Background Traffic Generalized Growth AM Peak Hour

609 & 615 Hamilton St N and 3 Nisbet Blvd, Waterdown, TIS
160860

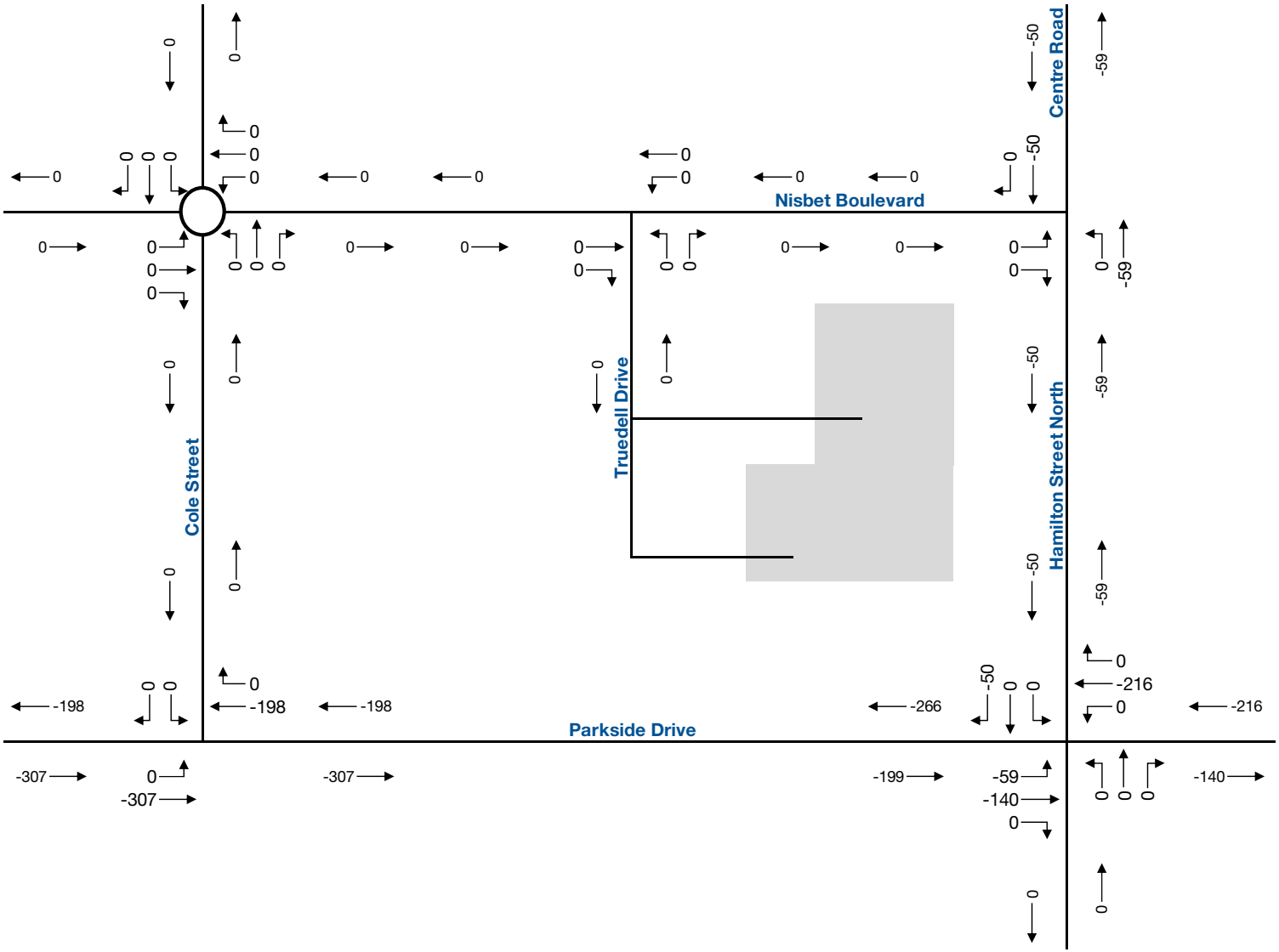
Figure C.1



2023 Background Traffic Generalized Growth PM Peak Hour

609 & 615 Hamilton St N and 3 Nisbet Blvd, Waterdown, TIS
160860

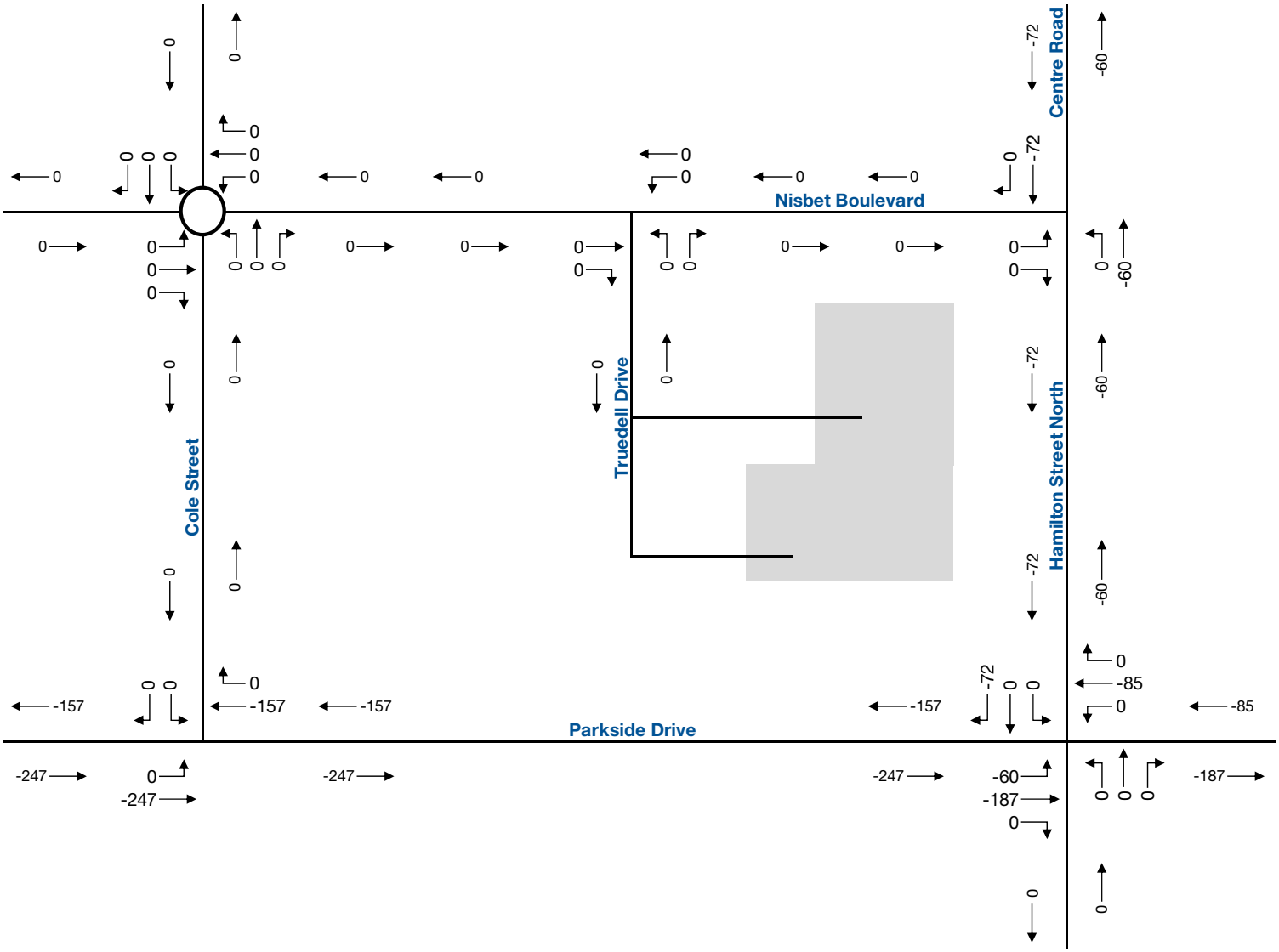
Figure C.2



New East-West Road Reassignment
AM Peak Hour

609 & 615 Hamilton St N and 3 Nisbet Blvd, Waterdown, TIS
160860

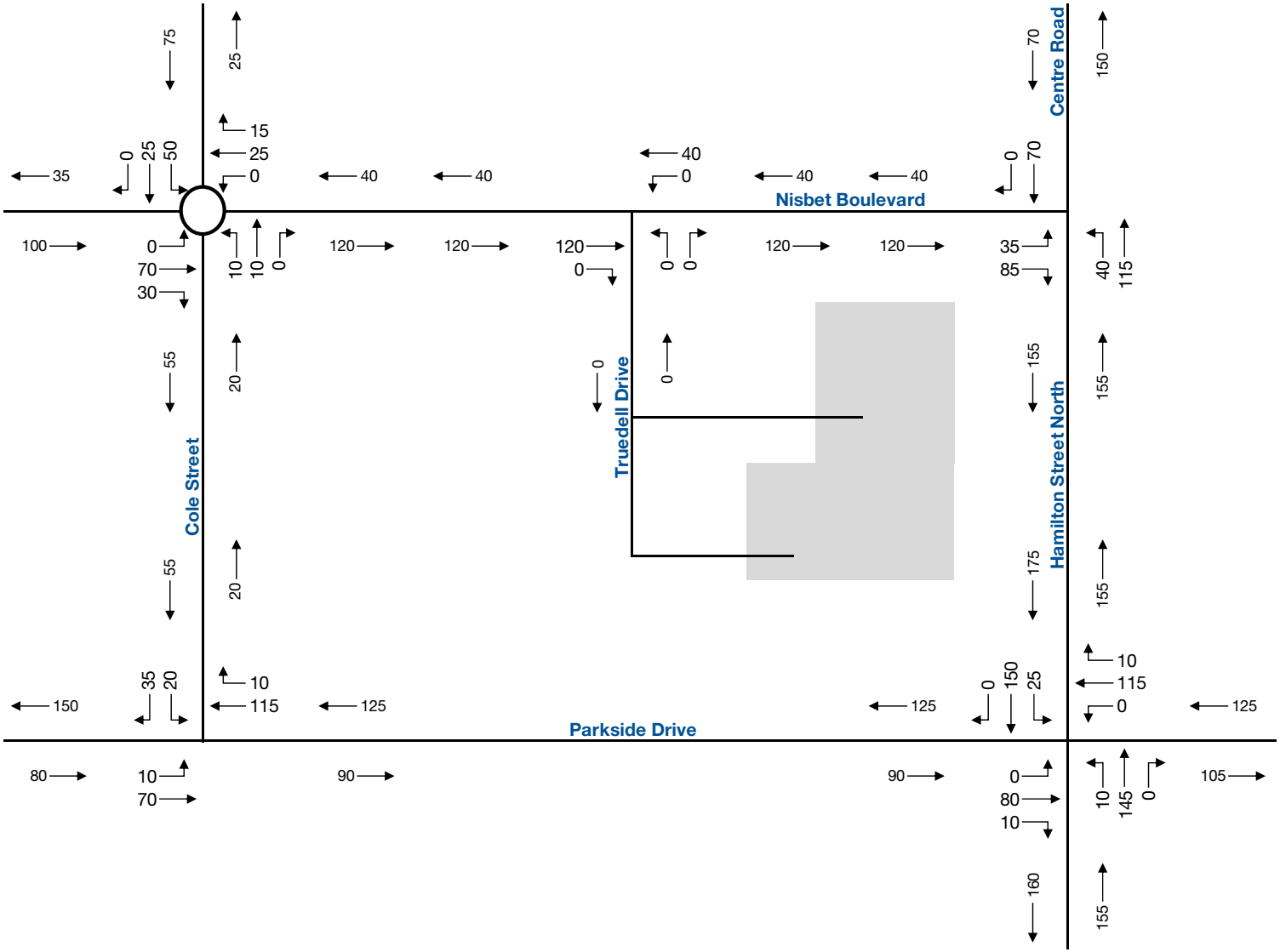
Figure C.3



New East-West Road Reassignment
PM Peak Hour

609 & 615 Hamilton St N and 3 Nisbet Blvd, Waterdown, TIS
160860

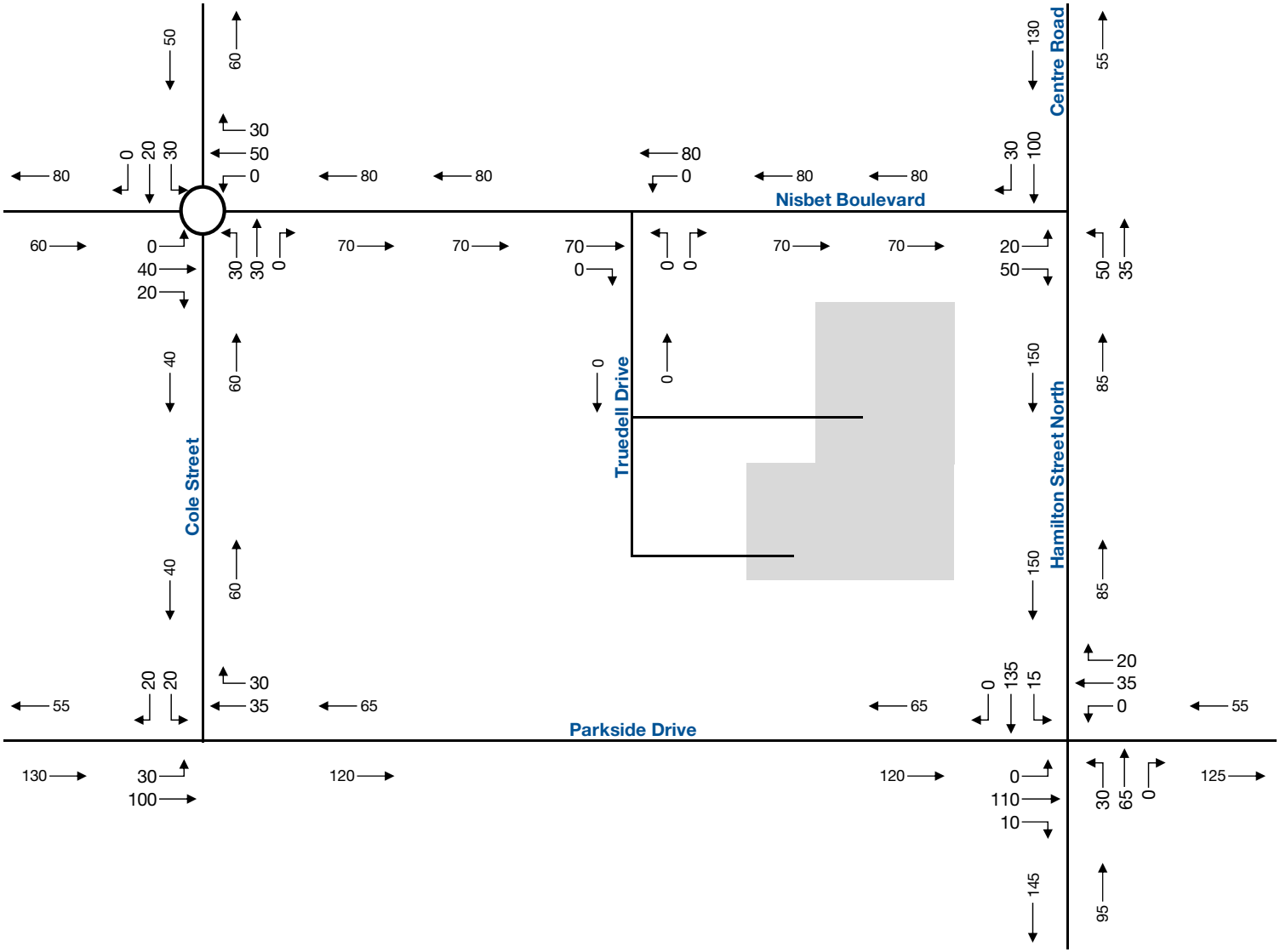
Figure C.4



2023 Other Developments Background Traffic AM Peak Hour

609 & 615 Hamilton St N and 3 Nisbet Blvd, Waterdown, TIS
160860

Figure C.5



2023 Other Developments Background Traffic PM Peak Hour

609 & 615 Hamilton St N and 3 Nisbet Blvd, Waterdown, TIS
160860

Figure C.6

Appendix D

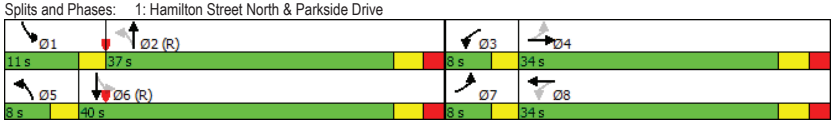
2023 Background Traffic Operations Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	408	89	83	112	103	102	366	90	256	430	129
Future Volume (vph)	91	408	89	83	112	103	102	366	90	256	430	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	50.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99		0.99	0.99		1.00				0.99	
Frt		0.973			0.928			0.970			0.965	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1764	0	1703	1608	0	1736	1752	0	1736	1722	0
Flt Permitted	0.535			0.142			0.205			0.213		
Satd. Flow (perm)	944	1764	0	253	1608	0	373	1752	0	389	1722	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			54			15			19	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	6		15	15		6	7					7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Adj. Flow (vph)	99	443	97	90	122	112	111	398	98	278	467	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	99	540	0	90	234	0	111	496	0	278	607	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	15.7		8.0	15.7		8.0	32.7		8.0	30.7	
Total Split (s)	8.0	34.0		8.0	34.0		8.0	37.0		11.0	40.0	
Total Split (%)	8.9%	37.8%		8.9%	37.8%		8.9%	41.1%		12.2%	44.4%	
Maximum Green (s)	5.0	28.3		5.0	28.3		5.0	31.3		8.0	34.3	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		10.0			10.0			10.0			10.0	
Flash Dont Walk (s)		18.0			17.0			17.0			15.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	34.8	28.1		34.8	28.1		40.3	32.4		46.8	37.7	
Actuated g/C Ratio	0.39	0.31		0.39	0.31		0.45	0.36		0.52	0.42	
v/c Ratio	0.24	0.96		0.51	0.43		0.45	0.78		0.84	0.83	
Control Delay	17.5	61.8		26.0	21.6		18.7	35.3		39.1	36.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.5	61.8		26.0	21.6		18.7	35.3		39.1	36.1	
LOS	B	E		C	C		B	D		D	D	
Approach Delay		54.9			22.8			32.2			37.1	
Approach LOS		D			C			C			D	

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green		
Natural Cycle: 90		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.96		
Intersection Signal Delay: 38.6		Intersection LOS: D
Intersection Capacity Utilization 86.8%		ICU Level of Service E
Analysis Period (min) 15		

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	99	540	90	234	111	496	278	607
v/c Ratio	0.24	0.96	0.51	0.43	0.45	0.78	0.84	0.83
Control Delay	17.5	61.8	26.0	21.6	18.7	35.3	39.1	36.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	61.8	26.0	21.6	18.7	35.3	39.1	36.1
Queue Length 50th (m)	10.5	93.8	9.5	25.2	10.3	78.3	28.7	100.0
Queue Length 95th (m)	20.6	#160.9	18.9	46.7	19.5	#130.5	#66.8	#168.0
Internal Link Dist (m)		191.8		134.9		206.2		208.7
Turn Bay Length (m)	40.0		50.0		40.0		40.0	
Base Capacity (vph)	406	563	178	542	245	640	332	732
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.96	0.51	0.43	0.45	0.78	0.84	0.83

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	408	89	83	112	103	102	366	90	256	430	129
Future Volume (vph)	91	408	89	83	112	103	102	366	90	256	430	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.93		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1764		1702	1608		1735	1753		1736	1723	
Flt Permitted	0.54	1.00		0.14	1.00		0.20	1.00		0.21	1.00	
Satd. Flow (perm)	948	1764		255	1608		374	1753		389	1723	
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)	99	443	97	90	122	112	111	398	98	278	467	140
RTOR Reduction (vph)	0	9	0	0	37	0	0	10	0	0	11	0
Lane Group Flow (vph)	99	531	0	90	197	0	111	486	0	278	596	0
Confl. Peds. (#/hr)	6		15	15		6	7					7
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	32.1	28.1		32.1	28.1		35.8	31.8		43.5	36.5	
Effective Green, g (s)	32.1	28.1		32.1	28.1		35.8	31.8		43.5	36.5	
Actuated g/C Ratio	0.36	0.31		0.36	0.31		0.40	0.35		0.48	0.41	
Clearance Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	370	550		155	502		209	619		318	698	
v/s Ratio Prot	0.01	c0.30		c0.03	0.12		0.02	0.28		c0.08	0.35	
v/s Ratio Perm	0.08			0.18			0.19			c0.34		
v/c Ratio	0.27	0.97		0.58	0.39		0.53	0.79		0.87	0.85	
Uniform Delay, d1	19.9	30.5		22.3	24.3		19.3	26.0		17.7	24.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	29.5		5.4	0.5		2.6	9.7		22.3	12.6	
Delay (s)	20.3	60.0		27.8	24.8		21.8	35.7		40.0	36.9	
Level of Service	C	E		C	C		C	D		D	D	
Approach Delay (s)		53.9			25.6			33.2			37.9	
Approach LOS		D			C			C			D	

Intersection Summary				
HCM 2000 Control Delay	39.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.92			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.4	
Intersection Capacity Utilization	86.8%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	23	568	333	25	46	55
Future Volume (vph)	23	568	333	25	46	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0			0.0	0.0	0.0
Storage Lanes	1			0	1	0
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.991		0.926	
Flt Protected	0.950				0.978	
Satd. Flow (prot)	1805	1827	1721	0	1666	0
Flt Permitted	0.950				0.978	
Satd. Flow (perm)	1805	1827	1721	0	1666	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		109.3	215.8		266.4	
Travel Time (s)		7.9	15.5		19.2	
Confl. Peds. (#/hr)	3			3	25	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	9%	15%	0%	6%
Adj. Flow (vph)	25	617	362	27	50	60
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	617	389	0	110	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	23	568	333	25	46	55
Future Volume (Veh/h)	23	568	333	25	46	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	617	362	27	50	60
Pedestrians			25		3	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			2		0	
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (m)			216			
pX, platoon unblocked						
vC, conflicting volume	392				1070	378
vC1, stage 1 conf vol					378	
vC2, stage 2 conf vol					692	
vCu, unblocked vol	392				1070	378
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.4
p0 queue free %	98				88	91
cM capacity (veh/h)	1175				431	658

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	25	617	389	110
Volume Left	25	0	0	50
Volume Right	0	0	27	60
cSH	1175	1700	1700	531
Volume to Capacity	0.02	0.36	0.23	0.21
Queue Length 95th (m)	0.5	0.0	0.0	6.2
Control Delay (s)	8.1	0.0	0.0	13.5
Lane LOS	A			B
Approach Delay (s)	0.3		0.0	13.5
Approach LOS				B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	87	185	57	493	632	22
Future Volume (vph)	87	185	57	493	632	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0	0.0	35.0			0.0
Storage Lanes	1	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850			0.995	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1568	1805	1792	1787	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1770	1568	1805	1792	1787	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	182.9			232.7	112.0	
Travel Time (s)	13.2			16.8	8.1	
Confl. Peds. (#/hr)	2	1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	0%	6%	6%	0%
Adj. Flow (vph)	95	201	62	536	687	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	201	62	536	711	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	87	185	57	493	632	22
Future Volume (Veh/h)	87	185	57	493	632	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	201	62	536	687	24
Pedestrians				1	2	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				233		
pX, platoon unblocked	0.82					
vC, conflicting volume	1361	700	711			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1331	700	711			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	27	54	93			
cM capacity (veh/h)	130	437	898			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	95	201	62	536	711
Volume Left	95	0	62	0	0
Volume Right	0	201	0	0	24
cSH	130	437	898	1700	1700
Volume to Capacity	0.73	0.46	0.07	0.32	0.42
Queue Length 95th (m)	33.2	18.9	1.8	0.0	0.0
Control Delay (s)	84.5	20.0	9.3	0.0	0.0
Lane LOS	F	C	A		
Approach Delay (s)	40.7		1.0		0.0
Approach LOS	E				

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	235	0	5	74	0	37
Future Volume (vph)	235	0	5	74	0	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.997		
Satd. Flow (prot)	1863	0	0	1660	1644	0
Flt Permitted				0.997		
Satd. Flow (perm)	1863	0	0	1660	1644	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	70.4			182.9	103.7	
Travel Time (s)	5.1			13.2	7.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	15%	0%	0%
Adj. Flow (vph)	255	0	5	80	0	40
Shared Lane Traffic (%)						
Lane Group Flow (vph)	255	0	0	85	40	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	22.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	235	0	5	74	0	37
Future Volume (Veh/h)	235	0	5	74	0	37
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	255	0	5	80	0	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			255		345	255
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			255		345	255
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			1322		653	789

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	255	85	40
Volume Left	0	5	0
Volume Right	0	0	40
cSH	1700	1322	789
Volume to Capacity	0.15	0.00	0.05
Queue Length 95th (m)	0.0	0.1	1.3
Control Delay (s)	0.0	0.5	9.8
Lane LOS		A	A
Approach Delay (s)	0.0	0.5	9.8
Approach LOS			A

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	22.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	155	44	3	51	20	16	10	28	52	25	0
Future Volume (vph)	3	155	44	3	51	20	16	10	28	52	25	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.970			0.963			0.930				
Flt Protected		0.999			0.998			0.986			0.967	
Satd. Flow (prot)	0	1798	0	0	1607	0	0	1693	0	0	1789	0
Flt Permitted		0.999			0.998			0.986			0.967	
Satd. Flow (perm)	0	1798	0	0	1607	0	0	1693	0	0	1789	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		145.2			70.4			266.4			79.7	
Travel Time (s)		10.5			5.1			19.2			5.7	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	4%	0%	15%	12%	10%	0%	0%	4%	0%	0%
Adj. Flow (vph)	3	168	48	3	55	22	17	11	30	57	27	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	219	0	0	80	0	0	58	0	0	84	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization	27.4%	ICU Level of Service A	
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	3	155	44	3	51	20	16	10	28	52	25	0
Future Volume (veh/h)	3	155	44	3	51	20	16	10	28	52	25	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	168	48	3	55	22	17	11	30	57	27	0
Approach Volume (veh/h)		219			80			58			84	
Crossing Volume (veh/h)		87			31			228			75	
High Capacity (veh/h)		1294			1352			1158			1306	
High v/c (veh/h)		0.17			0.06			0.05			0.06	
Low Capacity (veh/h)		1079			1131			956			1090	
Low v/c (veh/h)		0.20			0.07			0.06			0.08	

Intersection Summary					
Maximum v/c High		0.17			
Maximum v/c Low		0.20			
Intersection Capacity Utilization		27.4%	ICU Level of Service		A

Junctions 8

ARCADY 8 - Roundabout Module

Filename: Nisbet & Cole.arc8
Path: C:\Users\Matt\Documents\Paradigm\Projects\Arcady Projects\160860 UCO Property
Report generation date: 30/06/2016 10:20:55 AM

Summary of intersection performance

	AM						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	2023 Background						
Leg North	0.08	~1	3.22	0.07	A	3.54	A
Leg West	0.23	~1	3.77	0.19	A		
Leg South	0.06	~1	3.46	0.05	A		
Leg East	0.07	~1	3.31	0.07	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - 2016, AM" model duration: 8:00 AM - 9:30 AM
"D2 - 2016, PM" model duration: 4:00 PM - 5:30 PM
"D3 - 2023 Background, AM " model duration: 8:00 AM - 9:30 AM
"D4 - 2023 Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - 2023 Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - 2023 Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 30/06/2016 10:20:54 AM

File summary

Title	Nisbet & Cole
Location	Waterdown
Site Number	
Date	30/06/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	160860
Analyst	Matt
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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

2023 Background, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2023 Background, AM	2023 Background	AM		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	untitled	Roundabout	North,West,South,East			3.54	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Cole Street SB	
West	West	Nisbet Boulevard EB	
South	South	Cole Street NB	
East	East	Nisbet Boulevard WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
North	3.50	4.50	5.00	15.00	30.00	25.00	

West	3.50	4.50	5.00	15.00	30.00	25.00	
South	3.50	4.50	5.00	15.00	30.00	25.00	
East	3.50	4.50	5.00	15.00	30.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.565	1246.564
West		(calculated)	(calculated)	0.565	1246.564
South		(calculated)	(calculated)	0.565	1246.564
East		(calculated)	(calculated)	0.565	1246.564

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

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	77.00	100.000
West	ONE HOUR	✓	202.00	100.000
South	ONE HOUR	✓	54.00	100.000
East	ONE HOUR	✓	74.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	0.000	25.000	52.000
	West	3.000	0.000	44.000	155.000
	South	10.000	16.000	0.000	28.000
	East	20.000	51.000	3.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.00	0.32	0.68
	West	0.01	0.00	0.22	0.77
	South	0.19	0.30	0.00	0.52
	East	0.27	0.69	0.04	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.000	1.000
	West	1.000	1.000	1.010	1.020
	South	1.000	1.010	1.000	1.020
	East	1.010	1.070	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	0.0	0.0
	West	0.0	0.0	1.0	2.0
	South	0.0	1.0	0.0	2.0
	East	1.0	7.0	0.0	0.0

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
North	0.07	3.22	0.08	~1	A
West	0.19	3.77	0.23	~1	A
South	0.05	3.46	0.06	~1	A
East	0.07	3.31	0.07	~1	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	57.97	57.77	52.51	0.00	1215.29	0.048	0.05	3.109	A
West	152.08	151.49	60.02	0.00	1191.75	0.128	0.15	3.459	A
South	40.65	40.51	157.51	0.00	1140.98	0.036	0.04	3.270	A
East	55.71	55.51	21.75	0.00	1174.36	0.047	0.05	3.217	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	69.22	69.18	62.89	0.00	1209.11	0.057	0.06	3.157	A
West	181.59	181.46	71.87	0.00	1185.16	0.153	0.18	3.586	A
South	48.55	48.51	188.65	0.00	1123.35	0.043	0.04	3.348	A
East	66.52	66.48	26.05	0.00	1172.04	0.057	0.06	3.255	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	84.78	84.72	77.01	0.00	1200.70	0.071	0.08	3.225	A
West	222.41	222.20	88.02	0.00	1176.19	0.189	0.23	3.773	A
South	59.46	59.41	231.01	0.00	1099.36	0.054	0.06	3.461	A
East	81.48	81.42	31.90	0.00	1168.87	0.070	0.07	3.309	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	84.78	84.78	77.07	0.00	1200.66	0.071	0.08	3.225	A
West	222.41	222.40	88.08	0.00	1176.15	0.189	0.23	3.773	A
South	59.46	59.45	231.21	0.00	1099.25	0.054	0.06	3.461	A
East	81.48	81.47	31.93	0.00	1168.86	0.070	0.07	3.309	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	69.22	69.28	62.98	0.00	1209.05	0.057	0.06	3.160	A
West	181.59	181.80	71.98	0.00	1185.10	0.153	0.18	3.590	A
South	48.55	48.59	188.99	0.00	1123.16	0.043	0.05	3.349	A
East	66.52	66.58	26.10	0.00	1172.01	0.057	0.06	3.258	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	57.97	58.01	52.74	0.00	1215.15	0.048	0.05	3.112	A
West	152.08	152.22	60.27	0.00	1191.61	0.128	0.15	3.465	A
South	40.65	40.69	158.24	0.00	1140.57	0.036	0.04	3.274	A
East	55.71	55.75	21.85	0.00	1174.31	0.047	0.05	3.217	A

Queue Variation Results for each time segment

Queue Variation results: (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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Lanes, Volumes, Timings
1: Hamilton Street North & Parkside Drive

2023 Background PM
609 & 615 Hamilton St N and 3 Nisbet Blvd

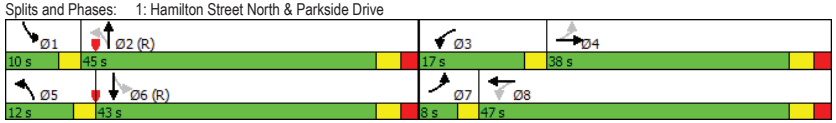
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	273	136	266	490	135	187	429	101	170	503	53
Future Volume (vph)	87	273	136	266	490	135	187	429	101	170	503	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	50.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	0.99			0.99			1.00	
Frt		0.950			0.968			0.971			0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1758	0	1805	1778	0	1752	1809	0	1770	1830	0
Flt Permitted	0.123			0.183			0.102			0.141		
Satd. Flow (perm)	229	1758	0	346	1778	0	188	1809	0	263	1830	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		23			14			12			5	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	5		10	10		5	7		5	5		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Adj. Flow (vph)	95	297	148	289	533	147	203	466	110	185	547	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	95	445	0	289	680	0	203	576	0	185	605	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	15.7		8.0	15.7		8.0	32.7		8.0	30.7	
Total Split (s)	8.0	38.0		17.0	47.0		12.0	45.0		10.0	43.0	
Total Split (%)	7.3%	34.5%		15.5%	42.7%		10.9%	40.9%		9.1%	39.1%	
Maximum Green (s)	5.0	32.3		14.0	41.3		9.0	39.3		7.0	37.3	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		10.0			10.0			7.0			7.0	
Flash Dont Walk (s)		18.0			17.0			17.0			15.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	40.3	32.6		52.0	41.3		51.0	39.3		47.0	37.3	
Actuated g/C Ratio	0.37	0.30		0.47	0.38		0.46	0.36		0.43	0.34	
v/c Ratio	0.62	0.83		0.84	1.01		0.94	0.88		0.89	0.97	
Control Delay	36.8	49.1		41.1	70.5		73.6	49.1		61.6	66.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	36.8	49.1		41.1	70.5		73.6	49.1		61.6	66.1	
LOS	D	D		D	E		E	D		E	E	
Approach Delay		46.9			61.8			55.5			65.0	
Approach LOS		D			E			E			E	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 58.4 Intersection LOS: E
Intersection Capacity Utilization 95.2% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	95	445	289	680	203	576	185	605
v/c Ratio	0.62	0.83	0.84	1.01	0.94	0.88	0.89	0.97
Control Delay	36.8	49.1	41.1	70.5	73.6	49.1	61.6	66.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	49.1	41.1	70.5	73.6	49.1	61.6	66.1
Queue Length 50th (m)	11.6	89.6	39.8	~151.6	28.6	118.8	23.9	132.8
Queue Length 95th (m)	#25.2	#144.3	#79.4	#232.5	#75.4	#184.9	#61.1	#207.7
Internal Link Dist (m)		191.8		134.9		206.2		208.7
Turn Bay Length (m)	40.0		50.0		40.0		40.0	
Base Capacity (vph)	154	536	349	676	215	654	208	623
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.83	0.83	1.01	0.94	0.88	0.89	0.97

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	273	136	266	490	135	187	429	101	170	503	53
Future Volume (vph)	87	273	136	266	490	135	187	429	101	170	503	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		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	
Frt	1.00	0.95		1.00	0.97		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1758		1803	1777		1752	1810		1770	1829	
Flt Permitted	0.12	1.00		0.18	1.00		0.10	1.00		0.14	1.00	
Satd. Flow (perm)	229	1758		347	1777		188	1810		262	1829	
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)	95	297	148	289	533	147	203	466	110	185	547	58
RTOR Reduction (vph)	0	16	0	0	9	0	0	8	0	0	3	0
Lane Group Flow (vph)	95	429	0	289	671	0	203	568	0	185	602	0
Confl. Peds. (#/hr)	5		10	10		5	7		5	5		7
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.6	32.6		49.3	41.3		48.3	39.3		44.3	37.3	
Effective Green, g (s)	37.6	32.6		49.3	41.3		48.3	39.3		44.3	37.3	
Actuated g/C Ratio	0.34	0.30		0.45	0.38		0.44	0.36		0.40	0.34	
Clearance Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	148	521		336	667		210	646		201	620	
v/s Ratio Prot	0.03	0.24		c0.11	c0.38		c0.08	0.31		0.06	0.33	
v/s Ratio Perm	0.19			0.28			c0.34			0.31		
v/c Ratio	0.64	0.82		0.86	1.01		0.97	0.88		0.92	0.97	
Uniform Delay, d1	28.8	36.0		23.3	34.4		27.4	33.1		27.5	35.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.2	10.1		19.5	36.4		52.0	15.8		41.7	29.6	
Delay (s)	38.0	46.2		42.8	70.8		79.5	48.9		69.2	65.4	
Level of Service	D	D		D	E		E	D		E	E	
Approach Delay (s)		44.7			62.4			56.9			66.3	
Approach LOS		D			E			E			E	

Intersection Summary				
HCM 2000 Control Delay	58.9	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.01			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	17.4	
Intersection Capacity Utilization	95.2%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	51	476	700	84	42	36
Future Volume (vph)	51	476	700	84	42	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0			0.0	0.0	0.0
Storage Lanes	1			0	1	0
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.986		0.938	
Flt Protected	0.950				0.974	
Satd. Flow (prot)	1805	1863	1841	0	1736	0
Flt Permitted	0.950				0.974	
Satd. Flow (perm)	1805	1863	1841	0	1736	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		109.3	215.8		266.4	
Travel Time (s)		7.9	15.5		19.2	
Confl. Peds. (#/hr)					3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%
Adj. Flow (vph)	55	517	761	91	46	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	55	517	852	0	85	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	53.6%	ICU Level of Service A	
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	51	476	700	84	42	36
Future Volume (Veh/h)	51	476	700	84	42	36
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	517	761	91	46	39
Pedestrians			3			
Lane Width (m)			3.6			
Walking Speed (m/s)			1.2			
Percent Blockage			0			
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (m)			216			
pX, platoon unblocked	0.60				0.60	0.60
vC, conflicting volume	852				1436	806
vC1, stage 1 conf vol					806	
vC2, stage 2 conf vol					630	
vCu, unblocked vol	412				1393	336
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	92				86	91
cM capacity (veh/h)	690				327	423

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	55	517	852	85
Volume Left	55	0	0	46
Volume Right	0	0	91	39
cSH	690	1700	1700	365
Volume to Capacity	0.08	0.30	0.50	0.23
Queue Length 95th (m)	2.1	0.0	0.0	7.1
Control Delay (s)	10.7	0.0	0.0	17.8
Lane LOS	B			C
Approach Delay (s)	1.0		0.0	17.8
Approach LOS				C

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization		53.6%	ICU Level of Service A
Analysis Period (min)		15	

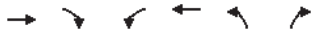
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	40	90	101	587	578	58
Future Volume (vph)	40	90	101	587	578	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0	0.0	35.0			0.0
Storage Lanes	1	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.988	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	1881	1860	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1805	1615	1805	1881	1860	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	182.9			232.7	112.0	
Travel Time (s)	13.2			16.8	8.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	43	98	110	638	628	63
Shared Lane Traffic (%)						
Lane Group Flow (vph)	43	98	110	638	691	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 52.9%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	40	90	101	587	578	58
Future Volume (Veh/h)	40	90	101	587	578	58
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	98	110	638	628	63
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				233		
pX, platoon unblocked	0.76					
vC, conflicting volume	1518	660	691			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1523	660	691			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	51	79	88			
cM capacity (veh/h)	88	467	913			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	43	98	110	638	691
Volume Left	43	0	110	0	0
Volume Right	0	98	0	0	63
cSH	88	467	913	1700	1700
Volume to Capacity	0.49	0.21	0.12	0.38	0.41
Queue Length 95th (m)	16.7	6.3	3.3	0.0	0.0
Control Delay (s)	80.0	14.7	9.5	0.0	0.0
Lane LOS	F	B	A		
Approach Delay (s)	34.6		1.4		0.0
Approach LOS	D				

Intersection Summary				
Average Delay		3.8		
Intersection Capacity Utilization		52.9%	ICU Level of Service	A
Analysis Period (min)		15		



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	129	0	23	135	0	1
Future Volume (vph)	129	0	23	135	0	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.993		
Satd. Flow (prot)	1863	0	0	1887	1644	0
Flt Permitted				0.993		
Satd. Flow (perm)	1863	0	0	1887	1644	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	70.4			182.9	103.7	
Travel Time (s)	5.1			13.2	7.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%
Adj. Flow (vph)	140	0	25	147	0	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	140	0	0	172	1	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	28.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	129	0	23	135	0	1
Future Volume (Veh/h)	129	0	23	135	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	140	0	25	147	0	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			140		337	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			140		337	140
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		100	100
cM capacity (veh/h)			1456		651	913

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	140	172	1
Volume Left	0	25	0
Volume Right	0	0	1
cSH	1700	1456	913
Volume to Capacity	0.08	0.02	0.00
Queue Length 95th (m)	0.0	0.4	0.0
Control Delay (s)	0.0	1.2	8.9
Lane LOS		A	A
Approach Delay (s)	0.0	1.2	8.9
Approach LOS			A

Intersection Summary			
Average Delay		0.7	
Intersection Capacity Utilization		28.5%	ICU Level of Service A
Analysis Period (min)		15	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	86	31	10	93	32	54	33	13	30	26	2
Future Volume (vph)	1	86	31	10	93	32	54	33	13	30	26	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.964			0.968			0.983			0.996	
Flt Protected					0.996			0.974			0.974	
Satd. Flow (prot)	0	1805	0	0	1832	0	0	1819	0	0	1843	0
Flt Permitted					0.996			0.974			0.974	
Satd. Flow (perm)	0	1805	0	0	1832	0	0	1819	0	0	1843	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		145.2			70.4			266.4			79.7	
Travel Time (s)		10.5			5.1			19.2			5.7	
Confl. Peds. (#/hr)	1		3	3		1	2		2	2		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	93	34	11	101	35	59	36	14	33	28	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	128	0	0	147	0	0	109	0	0	63	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 27.8%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	1	86	31	10	93	32	54	33	13	30	26	2
Future Volume (veh/h)	1	86	31	10	93	32	54	33	13	30	26	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	93	34	11	101	35	59	36	14	33	28	2
Approach Volume (veh/h)		128			147			109			63	
Crossing Volume (veh/h)		72			96			127			171	
High Capacity (veh/h)		1309			1285			1254			1211	
High v/c (veh/h)		0.10			0.11			0.09			0.05	
Low Capacity (veh/h)		1092			1070			1042			1004	
Low v/c (veh/h)		0.12			0.14			0.10			0.06	

Intersection Summary				
Maximum v/c High	0.11			
Maximum v/c Low	0.14			
Intersection Capacity Utilization	27.8%	ICU Level of Service	A	

Junctions 8

ARCADY 8 - Roundabout Module

Filename: Nisbet & Cole.arc8
Path: C:\Users\Matt\Documents\Paradigm\Projects\Arcady Projects\160860 UCO Property
Report generation date: 30/06/2016 10:20:39 AM

Summary of intersection performance

	PM						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	2023 Background						
Leg North	0.06	~1	3.32	0.06	A	3.43	A
Leg West	0.13	~1	3.48	0.11	A		
Leg South	0.10	~1	3.39	0.09	A		
Leg East	0.14	~1	3.45	0.12	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - 2016, AM" model duration: 8:00 AM - 9:30 AM
"D2 - 2016, PM" model duration: 4:00 PM - 5:30 PM
"D3 - 2023 Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - 2023 Background, PM " model duration: 4:00 PM - 5:30 PM
"D5 - 2023 Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - 2023 Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 30/06/2016 10:20:39 AM

File summary

Title	Nisbet & Cole
Location	Waterdown
Site Number	
Date	30/06/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	160860
Analyst	Matt
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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

2023 Background, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2023 Background, PM	2023 Background	PM		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	untitled	Roundabout	North,West,South,East			3.43	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Cole Street SB	
West	West	Nisbet Boulevard EB	
South	South	Cole Street NB	
East	East	Nisbet Boulevard WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

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
North	3.50	4.50	5.00	15.00	30.00	25.00	
West	3.50	4.50	5.00	15.00	30.00	25.00	
South	3.50	4.50	5.00	15.00	30.00	25.00	
East	3.50	4.50	5.00	15.00	30.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.565	1246.564
West		(calculated)	(calculated)	0.565	1246.564
South		(calculated)	(calculated)	0.565	1246.564
East		(calculated)	(calculated)	0.565	1246.564

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

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	58.00	100.000
West	ONE HOUR	✓	118.00	100.000
South	ONE HOUR	✓	100.00	100.000
East	ONE HOUR	✓	135.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	**West**	**South**	**East**
From	**North**	0.000	2.000	26.000	30.000
	West	1.000	0.000	31.000	86.000
	South	33.000	54.000	0.000	13.000
	East	32.000	93.000	10.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	**West**	**South**	**East**
From	**North**	0.00	0.03	0.45	0.52
	West	0.01	0.00	0.26	0.73
	South	0.33	0.54	0.00	0.13

	East	0.24	0.69	0.07	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.000	1.000
	West	1.000	1.000	1.000	1.050
	South	1.000	1.000	1.000	1.000
	East	1.000	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	0.0	0.0
	West	0.0	0.0	0.0	5.0
	South	0.0	0.0	0.0	0.0
	East	0.0	0.0	0.0	0.0

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
North	0.06	3.32	0.06	~1	A
West	0.11	3.48	0.13	~1	A
South	0.09	3.39	0.10	~1	A
East	0.12	3.45	0.14	~1	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	43.67	43.51	117.77	0.00	1179.97	0.037	0.04	3.167	A
West	88.84	88.51	49.51	0.00	1175.72	0.076	0.08	3.311	A
South	75.29	75.02	87.76	0.00	1195.12	0.063	0.07	3.214	A
East	101.64	101.27	66.02	0.00	1209.24	0.084	0.09	3.249	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	52.14	52.11	141.05	0.00	1166.81	0.045	0.05	3.228	A
West	106.08	106.01	59.29	0.00	1170.39	0.091	0.10	3.381	A
South	89.90	89.84	105.11	0.00	1184.95	0.076	0.08	3.286	A
East	121.36	121.28	79.06	0.00	1201.86	0.101	0.11	3.330	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	63.86	63.81	172.72	0.00	1148.90	0.056	0.06	3.317	A
West	129.92	129.82	72.61	0.00	1163.12	0.112	0.13	3.483	A
South	110.10	110.02	128.72	0.00	1171.11	0.094	0.10	3.392	A
East	148.64	148.52	96.81	0.00	1191.82	0.125	0.14	3.450	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	63.86	63.86	172.86	0.00	1148.82	0.056	0.06	3.317	A
West	129.92	129.92	72.67	0.00	1163.09	0.112	0.13	3.483	A
South	110.10	110.10	128.82	0.00	1171.05	0.094	0.10	3.392	A
East	148.64	148.64	96.89	0.00	1191.78	0.125	0.14	3.450	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	52.14	52.19	141.28	0.00	1166.68	0.045	0.05	3.232	A
West	106.08	106.18	59.39	0.00	1170.34	0.091	0.10	3.382	A
South	89.90	89.98	105.28	0.00	1184.85	0.076	0.08	3.290	A
East	121.36	121.48	79.18	0.00	1201.79	0.101	0.11	3.334	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	43.67	43.70	118.29	0.00	1179.68	0.037	0.04	3.170	A
West	88.84	88.91	49.73	0.00	1175.61	0.076	0.08	3.312	A
South	75.29	75.34	88.15	0.00	1194.89	0.063	0.07	3.215	A
East	101.64	101.72	66.30	0.00	1209.07	0.084	0.09	3.250	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

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
North	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

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
North	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Appendix E

2023 Total Traffic Operations Reports

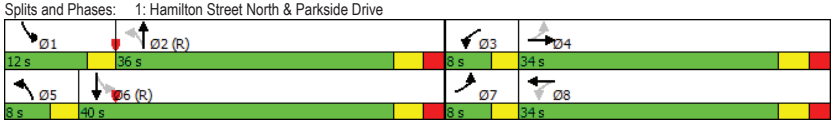
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Future Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	50.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	0.99		0.99	0.99		1.00				0.99	
Frt		0.973			0.928			0.970			0.966	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1764	0	1703	1608	0	1736	1752	0	1736	1724	0
Flt Permitted	0.534			0.142			0.196			0.200		
Satd. Flow (perm)	942	1764	0	253	1608	0	357	1752	0	365	1724	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			54			15			19	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	6		15	15		6	7					7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Adj. Flow (vph)	99	443	97	90	122	113	111	400	98	282	479	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	99	540	0	90	235	0	111	498	0	282	619	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	15.7		8.0	15.7		8.0	32.7		8.0	30.7	
Total Split (s)	8.0	34.0		8.0	34.0		8.0	36.0		12.0	40.0	
Total Split (%)	8.9%	37.8%		8.9%	37.8%		8.9%	40.0%		13.3%	44.4%	
Maximum Green (s)	5.0	28.3		5.0	28.3		5.0	30.3		9.0	34.3	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		10.0			10.0			10.0			10.0	
Flash Dont Walk (s)		18.0			17.0			17.0			15.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	34.8	28.1		34.8	28.1		39.4	31.5		46.8	37.7	
Actuated g/C Ratio	0.39	0.31		0.39	0.31		0.44	0.35		0.52	0.42	
v/c Ratio	0.24	0.96		0.51	0.44		0.47	0.80		0.84	0.85	
Control Delay	17.5	61.8		26.0	21.6		19.6	37.7		39.3	37.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.5	61.8		26.0	21.6		19.6	37.7		39.3	37.5	
LOS	B	E		C	C		B	D		D	D	
Approach Delay		54.9			22.8			34.4			38.1	
Approach LOS		D			C			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 39.5 Intersection LOS: D
Intersection Capacity Utilization 87.1% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	99	540	90	235	111	498	282	619
v/c Ratio	0.24	0.96	0.51	0.44	0.47	0.80	0.84	0.85
Control Delay	17.5	61.8	26.0	21.6	19.6	37.7	39.3	37.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.5	61.8	26.0	21.6	19.6	37.7	39.3	37.5
Queue Length 50th (m)	10.5	93.8	9.5	25.4	10.3	80.2	29.3	103.1
Queue Length 95th (m)	20.6	#160.9	18.9	46.9	19.5	#135.1	#67.5	#173.0
Internal Link Dist (m)		191.8		134.9		206.2		208.7
Turn Bay Length (m)	40.0		50.0		40.0		40.0	
Base Capacity (vph)	406	563	178	542	236	623	334	732
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.96	0.51	0.43	0.47	0.80	0.84	0.85

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Future Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.93		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1681	1764		1702	1608		1735	1753		1736	1724	
Flt Permitted	0.53	1.00		0.14	1.00		0.20	1.00		0.20	1.00	
Satd. Flow (perm)	945	1764		255	1608		359	1753		365	1724	
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)	99	443	97	90	122	113	111	400	98	282	479	140
RTOR Reduction (vph)	0	9	0	0	37	0	0	10	0	0	11	0
Lane Group Flow (vph)	99	531	0	90	198	0	111	488	0	282	608	0
Confl. Peds. (#/hr)	6		15	15		6	7					7
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	32.1	28.1		32.1	28.1		35.0	31.0		43.5	36.5	
Effective Green, g (s)	32.1	28.1		32.1	28.1		35.0	31.0		43.5	36.5	
Actuated g/C Ratio	0.36	0.31		0.36	0.31		0.39	0.34		0.48	0.41	
Clearance Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	369	550		155	502		200	603		321	699	
v/s Ratio Prot	0.01	c0.30		c0.03	0.12		0.02	0.28		c0.09	0.35	
v/s Ratio Perm	0.08			0.18			0.19			c0.33		
v/c Ratio	0.27	0.97		0.58	0.39		0.56	0.81		0.88	0.87	
Uniform Delay, d1	19.9	30.5		22.3	24.3		19.8	26.8		17.6	24.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	29.5		5.4	0.5		3.3	11.2		22.7	13.9	
Delay (s)	20.3	60.0		27.8	24.8		23.1	38.0		40.3	38.4	
Level of Service	C	E		C	C		C	D		D	D	
Approach Delay (s)		53.9			25.6			35.3			39.0	
Approach LOS		D			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	40.2	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.93			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.4	
Intersection Capacity Utilization	87.1%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	568	333	25	46	59
Future Volume (vph)	24	568	333	25	46	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0			0.0	0.0	0.0
Storage Lanes	1			0	1	0
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.991		0.924	
Flt Protected	0.950				0.979	
Satd. Flow (prot)	1805	1827	1721	0	1663	0
Flt Permitted	0.950				0.979	
Satd. Flow (perm)	1805	1827	1721	0	1663	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		109.3	215.8		266.4	
Travel Time (s)		7.9	15.5		19.2	
Confl. Peds. (#/hr)	3			3	25	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	4%	9%	15%	0%	6%
Adj. Flow (vph)	26	617	362	27	50	64
Shared Lane Traffic (%)						
Lane Group Flow (vph)	26	617	389	0	114	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	568	333	25	46	59
Future Volume (Veh/h)	24	568	333	25	46	59
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	617	362	27	50	64
Pedestrians			25		3	
Lane Width (m)			3.6		3.6	
Walking Speed (m/s)			1.2		1.2	
Percent Blockage			2		0	
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (m)			216			
pX, platoon unblocked						
vC, conflicting volume	392				1072	378
vC1, stage 1 conf vol					378	
vC2, stage 2 conf vol					694	
vCu, unblocked vol	392				1072	378
tC, single (s)	4.1				6.4	6.3
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.4
p0 queue free %	98				88	90
cM capacity (veh/h)	1175				430	658

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	26	617	389	114
Volume Left	26	0	0	50
Volume Right	0	0	27	64
cSH	1175	1700	1700	534
Volume to Capacity	0.02	0.36	0.23	0.21
Queue Length 95th (m)	0.5	0.0	0.0	6.4
Control Delay (s)	8.1	0.0	0.0	13.6
Lane LOS	A			B
Approach Delay (s)	0.3		0.0	13.6
Approach LOS				B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	91	199	60	493	632	23
Future Volume (vph)	91	199	60	493	632	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0	0.0	35.0			0.0
Storage Lanes	1	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt		0.850			0.995	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1568	1805	1792	1787	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1770	1568	1805	1792	1787	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	182.9			232.7	112.0	
Travel Time (s)	13.2			16.8	8.1	
Confl. Peds. (#/hr)	2	1				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	3%	0%	6%	6%	0%
Adj. Flow (vph)	99	216	65	536	687	25
Shared Lane Traffic (%)						
Lane Group Flow (vph)	99	216	65	536	712	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	91	199	60	493	632	23
Future Volume (Veh/h)	91	199	60	493	632	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	216	65	536	687	25
Pedestrians				1	2	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	0	
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				233		
pX, platoon unblocked	0.82					
vC, conflicting volume	1368	700	712			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1339	700	712			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	23	51	93			
cM capacity (veh/h)	128	437	897			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	99	216	65	536	712
Volume Left	99	0	65	0	0
Volume Right	0	216	0	0	25
cSH	128	437	897	1700	1700
Volume to Capacity	0.77	0.49	0.07	0.32	0.42
Queue Length 95th (m)	36.3	21.4	1.9	0.0	0.0
Control Delay (s)	93.3	21.0	9.3	0.0	0.0
Lane LOS	F	C	A		
Approach Delay (s)	43.7		1.0		0.0
Approach LOS	E				

Intersection Summary			
Average Delay	8.8		
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	235	1	8	74	4	52
Future Volume (vph)	235	1	8	74	4	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.999				0.874	
Flt Protected				0.995	0.997	
Satd. Flow (prot)	1861	0	0	1666	1656	0
Flt Permitted				0.995	0.997	
Satd. Flow (perm)	1861	0	0	1666	1656	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	70.4			182.9	103.7	
Travel Time (s)	5.1			13.2	7.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	15%	0%	0%
Adj. Flow (vph)	255	1	9	80	4	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	256	0	0	89	61	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	235	1	8	74	4	52
Future Volume (Veh/h)	235	1	8	74	4	52
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	255	1	9	80	4	57
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			256		354	256
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			256		354	256
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		99	93
cM capacity (veh/h)			1321		644	788

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	256	89	61
Volume Left	0	9	4
Volume Right	1	0	57
cSH	1700	1321	777
Volume to Capacity	0.15	0.01	0.08
Queue Length 95th (m)	0.0	0.2	2.0
Control Delay (s)	0.0	0.8	10.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	10.0
Approach LOS			B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	155	44	7	51	20	16	10	29	52	25	0
Future Volume (vph)	3	155	44	7	51	20	16	10	29	52	25	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.970			0.965			0.928				
Flt Protected		0.999			0.995			0.986			0.967	
Satd. Flow (prot)	0	1798	0	0	1617	0	0	1691	0	0	1789	0
Flt Permitted		0.999			0.995			0.986			0.967	
Satd. Flow (perm)	0	1798	0	0	1617	0	0	1691	0	0	1789	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		145.2			70.4			266.4			79.7	
Travel Time (s)		10.5			5.1			19.2			5.7	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	4%	0%	15%	12%	10%	0%	0%	4%	0%	0%
Adj. Flow (vph)	3	168	48	8	55	22	17	11	32	57	27	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	219	0	0	85	0	0	60	0	0	84	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization	27.1%	ICU Level of Service A	
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	3	155	44	7	51	20	16	10	29	52	25	0
Future Volume (veh/h)	3	155	44	7	51	20	16	10	29	52	25	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	168	48	8	55	22	17	11	32	57	27	0
Approach Volume (veh/h)		219			85			60			84	
Crossing Volume (veh/h)		92			31			228			80	
High Capacity (veh/h)		1289			1352			1158			1301	
High v/c (veh/h)		0.17			0.06			0.05			0.06	
Low Capacity (veh/h)		1074			1131			956			1085	
Low v/c (veh/h)		0.20			0.08			0.06			0.08	

Intersection Summary					
Maximum v/c High		0.17			
Maximum v/c Low		0.20			
Intersection Capacity Utilization		27.1%	ICU Level of Service		A

Junctions 8

ARCADY 8 - Roundabout Module

Filename: Nisbet & Cole.arc8
Path: C:\Users\Matt\Documents\Paradigm\Projects\Arcady Projects\160860 UCO Property
Report generation date: 30/06/2016 10:20:15 AM

Summary of intersection performance

	AM						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	2023 Total						
Leg North	0.08	~1	3.23	0.07	A	3.55	A
Leg West	0.23	~1	3.78	0.19	A		
Leg South	0.06	~1	3.47	0.06	A		
Leg East	0.08	~1	3.31	0.07	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - 2016, AM" model duration: 8:00 AM - 9:30 AM
"D2 - 2016, PM" model duration: 4:00 PM - 5:30 PM
"D3 - 2023 Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - 2023 Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - 2023 Total, AM " model duration: 8:00 AM - 9:30 AM
"D6 - 2023 Total, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 30/06/2016 10:20:15 AM

File summary

Title	Nisbet & Cole
Location	Waterdown
Site Number	
Date	30/06/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	160860
Analyst	Matt
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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

2023 Total, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2023 Total, AM	2023 Total	AM		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	untitled	Roundabout	North,West,South,East			3.55	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Cole Street SB	
West	West	Nisbet Boulevard EB	
South	South	Cole Street NB	
East	East	Nisbet Boulevard WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

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
North	3.50	4.50	5.00	15.00	30.00	25.00	

West	3.50	4.50	5.00	15.00	30.00	25.00	
South	3.50	4.50	5.00	15.00	30.00	25.00	
East	3.50	4.50	5.00	15.00	30.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.565	1246.564
West		(calculated)	(calculated)	0.565	1246.564
South		(calculated)	(calculated)	0.565	1246.564
East		(calculated)	(calculated)	0.565	1246.564

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

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	77.00	100.000
West	ONE HOUR	✓	202.00	100.000
South	ONE HOUR	✓	55.00	100.000
East	ONE HOUR	✓	78.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	0.000	25.000	52.000
	West	3.000	0.000	44.000	155.000
	South	10.000	16.000	0.000	29.000
	East	20.000	51.000	7.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.00	0.00	0.32	0.68
	West	0.01	0.00	0.22	0.77
	South	0.18	0.29	0.00	0.53
	East	0.26	0.65	0.09	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.000	1.000
	West	1.000	1.000	1.010	1.020
	South	1.000	1.010	1.000	1.020
	East	1.010	1.070	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	0.0	0.0
	West	0.0	0.0	1.0	2.0
	South	0.0	1.0	0.0	2.0
	East	1.0	7.0	0.0	0.0

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
North	0.07	3.23	0.08	~1	A
West	0.19	3.78	0.23	~1	A
South	0.06	3.47	0.06	~1	A
East	0.07	3.31	0.08	~1	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	57.97	57.77	55.51	0.00	1213.59	0.048	0.05	3.114	A
West	152.08	151.49	63.02	0.00	1190.08	0.128	0.15	3.464	A
South	41.41	41.26	157.51	0.00	1140.85	0.036	0.04	3.273	A
East	58.72	58.51	21.75	0.00	1177.30	0.050	0.05	3.217	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	69.22	69.18	66.48	0.00	1207.08	0.057	0.06	3.163	A
West	181.59	181.46	75.47	0.00	1183.16	0.153	0.18	3.593	A
South	49.44	49.41	188.65	0.00	1123.21	0.044	0.05	3.351	A
East	70.12	70.08	26.05	0.00	1174.97	0.060	0.06	3.257	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	84.78	84.72	81.41	0.00	1198.21	0.071	0.08	3.232	A
West	222.41	222.20	92.42	0.00	1173.74	0.189	0.23	3.783	A
South	60.56	60.51	231.01	0.00	1099.23	0.055	0.06	3.465	A
East	85.88	85.82	31.90	0.00	1171.79	0.073	0.08	3.314	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	84.78	84.78	81.47	0.00	1198.17	0.071	0.08	3.232	A
West	222.41	222.40	92.49	0.00	1173.71	0.189	0.23	3.783	A
South	60.56	60.56	231.21	0.00	1099.12	0.055	0.06	3.465	A
East	85.88	85.88	31.93	0.00	1171.78	0.073	0.08	3.314	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	69.22	69.28	66.58	0.00	1207.02	0.057	0.06	3.163	A
West	181.59	181.80	75.58	0.00	1183.10	0.153	0.18	3.597	A
South	49.44	49.49	188.99	0.00	1123.02	0.044	0.05	3.352	A
East	70.12	70.18	26.10	0.00	1174.94	0.060	0.06	3.260	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	57.97	58.01	55.75	0.00	1213.45	0.048	0.05	3.115	A
West	152.08	152.22	63.29	0.00	1189.93	0.128	0.15	3.468	A
South	41.41	41.44	158.24	0.00	1140.43	0.036	0.04	3.277	A
East	58.72	58.77	21.85	0.00	1177.24	0.050	0.05	3.218	A

Queue Variation Results for each time segment

Queue Variation results: (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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (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
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Lanes, Volumes, Timings
1: Hamilton Street North & Parkside Drive

2023 Total PM
609 & 615 Hamilton St N and 3 Nisbet Blvd

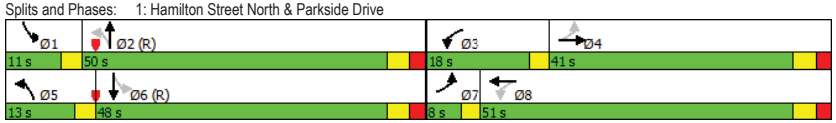
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	273	136	266	490	138	187	439	101	172	508	53
Future Volume (vph)	87	273	136	266	490	138	187	439	101	172	508	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		0.0	50.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.99		0.99	0.99			0.99			1.00	
Frt		0.950			0.967			0.972			0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1757	0	1805	1775	0	1752	1811	0	1770	1830	0
Flt Permitted	0.113			0.176			0.090			0.140		
Satd. Flow (perm)	210	1757	0	332	1775	0	166	1811	0	261	1830	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			14			11			5	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	5		10	10		5	7		5	5		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Adj. Flow (vph)	95	297	148	289	533	150	203	477	110	187	552	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	95	445	0	289	683	0	203	587	0	187	610	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0		5.0	20.0		5.0	20.0	
Minimum Split (s)	8.0	15.7		8.0	15.7		8.0	32.7		8.0	30.7	
Total Split (s)	8.0	41.0		18.0	51.0		13.0	50.0		11.0	48.0	
Total Split (%)	6.7%	34.2%		15.0%	42.5%		10.8%	41.7%		9.2%	40.0%	
Maximum Green (s)	5.0	35.3		15.0	45.3		10.0	44.3		8.0	42.3	
Yellow Time (s)	3.0	3.3		3.0	3.3		3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.4		0.0	2.4		0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Walk Time (s)		10.0			10.0			7.0			7.0	
Flash Dont Walk (s)		18.0			17.0			17.0			15.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	43.2	35.5		56.0	45.3		57.0	44.3		53.0	42.3	
Actuated g/C Ratio	0.36	0.30		0.47	0.38		0.48	0.37		0.44	0.35	
v/c Ratio	0.68	0.83		0.86	1.01		0.96	0.87		0.87	0.94	
Control Delay	45.5	52.5		46.4	73.4		81.2	49.6		57.4	61.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	45.5	52.5		46.4	73.4		81.2	49.6		57.4	61.6	
LOS	D	D		D	E		F	D		E	E	
Approach Delay		51.3			65.3			57.7			60.6	
Approach LOS		D			E			E			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 59.7 Intersection LOS: E
Intersection Capacity Utilization 95.7% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	95	445	289	683	203	587	187	610
v/c Ratio	0.68	0.83	0.86	1.01	0.96	0.87	0.87	0.94
Control Delay	45.5	52.5	46.4	73.4	81.2	49.6	57.4	61.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.5	52.5	46.4	73.4	81.2	49.6	57.4	61.6
Queue Length 50th (m)	13.0	99.0	44.4	~167.7	33.4	131.9	26.0	144.7
Queue Length 95th (m)	#31.0	#154.3	#88.1	#250.0	#82.7	#198.3	#62.7	#219.7
Internal Link Dist (m)		191.8		134.9		206.2		208.7
Turn Bay Length (m)	40.0		50.0		40.0		40.0	
Base Capacity (vph)	140	534	339	678	211	675	215	648
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.83	0.85	1.01	0.96	0.87	0.87	0.94

Intersection Summary

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

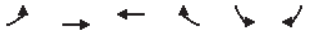
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	273	136	266	490	138	187	439	101	172	508	53
Future Volume (vph)	87	273	136	266	490	138	187	439	101	172	508	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		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	
Frt	1.00	0.95		1.00	0.97		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1757		1803	1776		1752	1811		1770	1829	
Flt Permitted	0.11	1.00		0.18	1.00		0.09	1.00		0.14	1.00	
Satd. Flow (perm)	210	1757		335	1776		167	1811		261	1829	
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)	95	297	148	289	533	150	203	477	110	187	552	58
RTOR Reduction (vph)	0	15	0	0	9	0	0	7	0	0	3	0
Lane Group Flow (vph)	95	430	0	289	674	0	203	580	0	187	607	0
Confl. Peds. (#/hr)	5		10	10		5	7		5	5		7
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	40.5	35.5		53.3	45.3		54.3	44.3		50.3	42.3	
Effective Green, g (s)	40.5	35.5		53.3	45.3		54.3	44.3		50.3	42.3	
Actuated g/C Ratio	0.34	0.30		0.44	0.38		0.45	0.37		0.42	0.35	
Clearance Time (s)	3.0	5.7		3.0	5.7		3.0	5.7		3.0	5.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	135	519		329	670		207	668		210	644	
v/s Ratio Prot	0.03	0.24		c0.11	c0.38		c0.08	0.32		0.06	0.33	
v/s Ratio Perm	0.21			0.28			c0.36			0.31		
v/c Ratio	0.70	0.83		0.88	1.01		0.98	0.87		0.89	0.94	
Uniform Delay, d1	31.9	39.4		25.8	37.4		32.2	35.1		27.8	37.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.3	10.5		22.3	36.3		56.8	14.3		34.0	23.8	
Delay (s)	47.2	49.9		48.1	73.7		89.0	49.5		61.8	61.5	
Level of Service	D	D		D	E		F	D		E	E	
Approach Delay (s)		49.5			66.1			59.6			61.5	
Approach LOS		D			E			E			E	

Intersection Summary				
HCM 2000 Control Delay	60.4	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.02			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.4	
Intersection Capacity Utilization	95.7%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	55	476	700	84	42	38
Future Volume (vph)	55	476	700	84	42	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0			0.0	0.0	0.0
Storage Lanes	1			0	1	0
Taper Length (m)	7.5				7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.986		0.936	
Flt Protected	0.950				0.974	
Satd. Flow (prot)	1805	1863	1841	0	1732	0
Flt Permitted	0.950				0.974	
Satd. Flow (perm)	1805	1863	1841	0	1732	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		109.3	215.8		266.4	
Travel Time (s)		7.9	15.5		19.2	
Confl. Peds. (#/hr)					3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	2%	0%	0%	0%
Adj. Flow (vph)	60	517	761	91	46	41
Shared Lane Traffic (%)						
Lane Group Flow (vph)	60	517	852	0	87	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	57.0%	ICU Level of Service B	
Analysis Period (min)	15		



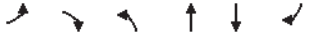
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	55	476	700	84	42	38
Future Volume (Veh/h)	55	476	700	84	42	38
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	517	761	91	46	41
Pedestrians			3			
Lane Width (m)			3.6			
Walking Speed (m/s)			1.2			
Percent Blockage			0			
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (m)			216			
pX, platoon unblocked	0.59				0.59	0.59
vC, conflicting volume	852				1446	806
vC1, stage 1 conf vol					806	
vC2, stage 2 conf vol					640	
vCu, unblocked vol	402				1409	325
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	91				86	90
cM capacity (veh/h)	689				324	425

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	60	517	852	87
Volume Left	60	0	0	46
Volume Right	0	0	91	41
cSH	689	1700	1700	365
Volume to Capacity	0.09	0.30	0.50	0.24
Queue Length 95th (m)	2.3	0.0	0.0	7.3
Control Delay (s)	10.7	0.0	0.0	17.9
Lane LOS	B			C
Approach Delay (s)	1.1		0.0	17.9
Approach LOS				C

Intersection Summary			
Average Delay		1.5	
Intersection Capacity Utilization		57.0%	ICU Level of Service B
Analysis Period (min)		15	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	42	97	114	587	578	62
Future Volume (vph)	42	97	114	587	578	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	25.0	0.0	35.0			0.0
Storage Lanes	1	1	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.987	
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1805	1615	1805	1881	1859	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1805	1615	1805	1881	1859	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	182.9			232.7	112.0	
Travel Time (s)	13.2			16.8	8.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	1%	1%	0%
Adj. Flow (vph)	46	105	124	638	628	67
Shared Lane Traffic (%)						
Lane Group Flow (vph)	46	105	124	638	695	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.8%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	97	114	587	578	62
Future Volume (Veh/h)	42	97	114	587	578	62
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	105	124	638	628	67
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)				233		
pX, platoon unblocked	0.76					
vC, conflicting volume	1548	662	695			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1563	662	695			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	43	77	86			
cM capacity (veh/h)	81	466	910			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1
Volume Total	46	105	124	638	695
Volume Left	46	0	124	0	0
Volume Right	0	105	0	0	67
cSH	81	466	910	1700	1700
Volume to Capacity	0.57	0.23	0.14	0.38	0.41
Queue Length 95th (m)	20.0	6.9	3.8	0.0	0.0
Control Delay (s)	96.0	15.0	9.6	0.0	0.0
Lane LOS	F	B	A		
Approach Delay (s)	39.6		1.6		0.0
Approach LOS	E				

Intersection Summary			
Average Delay		4.5	
Intersection Capacity Utilization		53.8%	ICU Level of Service A
Analysis Period (min)		15	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	129	4	37	135	2	9
Future Volume (vph)	129	4	37	135	2	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.996				0.887	
Flt Protected				0.989	0.992	
Satd. Flow (prot)	1856	0	0	1879	1672	0
Flt Permitted				0.989	0.992	
Satd. Flow (perm)	1856	0	0	1879	1672	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	70.4			182.9	103.7	
Travel Time (s)	5.1			13.2	7.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	0%	0%	0%
Adj. Flow (vph)	140	4	40	147	2	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	144	0	0	187	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			3.6	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	29.5%	ICU Level of Service A	
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	129	4	37	135	2	9
Future Volume (Veh/h)	129	4	37	135	2	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	140	4	40	147	2	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			144		369	142
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			144		369	142
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		100	99
cM capacity (veh/h)			1451		618	911

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	144	187	12
Volume Left	0	40	2
Volume Right	4	0	10
cSH	1700	1451	844
Volume to Capacity	0.08	0.03	0.01
Queue Length 95th (m)	0.0	0.7	0.3
Control Delay (s)	0.0	1.8	9.3
Lane LOS		A	A
Approach Delay (s)	0.0	1.8	9.3
Approach LOS			A

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		29.5%	ICU Level of Service A
Analysis Period (min)		15	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	86	31	12	93	32	54	33	17	30	26	2
Future Volume (vph)	1	86	31	12	93	32	54	33	17	30	26	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.964			0.968			0.978			0.996	
Flt Protected					0.996			0.975			0.974	
Satd. Flow (prot)	0	1805	0	0	1832	0	0	1812	0	0	1843	0
Flt Permitted					0.996			0.975			0.974	
Satd. Flow (perm)	0	1805	0	0	1832	0	0	1812	0	0	1843	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		145.2			70.4			266.4			79.7	
Travel Time (s)		10.5			5.1			19.2			5.7	
Confl. Peds. (#/hr)	1		3	3		1	2		2	2		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	93	34	13	101	35	59	36	18	33	28	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	128	0	0	149	0	0	113	0	0	63	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 28.5%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	1	86	31	12	93	32	54	33	17	30	26	2
Future Volume (veh/h)	1	86	31	12	93	32	54	33	17	30	26	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	93	34	13	101	35	59	36	18	33	28	2
Approach Volume (veh/h)		128			149			113			63	
Crossing Volume (veh/h)		74			96			127			173	
High Capacity (veh/h)		1307			1285			1254			1210	
High v/c (veh/h)		0.10			0.12			0.09			0.05	
Low Capacity (veh/h)		1091			1070			1042			1002	
Low v/c (veh/h)		0.12			0.14			0.11			0.06	

Intersection Summary				
Maximum v/c High	0.12			
Maximum v/c Low	0.14			
Intersection Capacity Utilization	28.5%	ICU Level of Service	A	

Junctions 8

ARCADY 8 - Roundabout Module

Filename: Nisbet & Cole.arc8
Path: C:\Users\Matt\Documents\Paradigm\Projects\Arcady Projects\160860 UCO Property
Report generation date: 30/06/2016 10:19:56 AM

Summary of intersection performance

	PM						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	2023 Total						
Leg North	0.06	~1	3.32	0.06	A	3.43	A
Leg West	0.13	~1	3.49	0.11	A		
Leg South	0.11	~1	3.41	0.10	A		
Leg East	0.14	~1	3.46	0.13	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - 2016, AM" model duration: 8:00 AM - 9:30 AM
"D2 - 2016, PM" model duration: 4:00 PM - 5:30 PM
"D3 - 2023 Background, AM" model duration: 8:00 AM - 9:30 AM
"D4 - 2023 Background, PM" model duration: 4:00 PM - 5:30 PM
"D5 - 2023 Total, AM" model duration: 8:00 AM - 9:30 AM
"D6 - 2023 Total, PM " model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 30/06/2016 10:19:56 AM

File summary

Title	Nisbet & Cole
Location	Waterdown
Site Number	
Date	30/06/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	160860
Analyst	Matt
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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

2023 Total, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2023 Total, PM	2023 Total	PM		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	untitled	Roundabout	North,West,South,East			3.43	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Cole Street SB	
West	West	Nisbet Boulevard EB	
South	South	Cole Street NB	
East	East	Nisbet Boulevard WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

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
North	3.50	4.50	5.00	15.00	30.00	25.00	
West	3.50	4.50	5.00	15.00	30.00	25.00	
South	3.50	4.50	5.00	15.00	30.00	25.00	
East	3.50	4.50	5.00	15.00	30.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.565	1246.564
West		(calculated)	(calculated)	0.565	1246.564
South		(calculated)	(calculated)	0.565	1246.564
East		(calculated)	(calculated)	0.565	1246.564

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

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	58.00	100.000
West	ONE HOUR	✓	118.00	100.000
South	ONE HOUR	✓	104.00	100.000
East	ONE HOUR	✓	137.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	**West**	**South**	**East**
From	**North**	0.000	2.000	26.000	30.000
	West	1.000	0.000	31.000	86.000
	South	33.000	54.000	0.000	17.000
	East	32.000	93.000	12.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	**West**	**South**	**East**
From	**North**	0.00	0.03	0.45	0.52
	West	0.01	0.00	0.26	0.73
	South	0.32	0.52	0.00	0.16

	East	0.23	0.68	0.09	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.000	1.000
	West	1.000	1.000	1.000	1.050
	South	1.000	1.000	1.000	1.000
	East	1.000	1.000	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	0.0	0.0
	West	0.0	0.0	0.0	5.0
	South	0.0	0.0	0.0	0.0
	East	0.0	0.0	0.0	0.0

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
North	0.06	3.32	0.06	~1	A
West	0.11	3.49	0.13	~1	A
South	0.10	3.41	0.11	~1	A
East	0.13	3.46	0.14	~1	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	43.67	43.51	119.27	0.00	1179.12	0.037	0.04	3.169	A
West	88.84	88.51	51.01	0.00	1174.91	0.076	0.08	3.313	A
South	78.30	78.02	87.76	0.00	1195.12	0.066	0.07	3.222	A
East	103.14	102.77	66.01	0.00	1209.24	0.085	0.09	3.253	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	52.14	52.11	142.84	0.00	1165.80	0.045	0.05	3.231	A
West	106.08	106.01	61.09	0.00	1169.41	0.091	0.10	3.384	A
South	93.49	93.43	105.11	0.00	1184.95	0.079	0.09	3.297	A
East	123.16	123.08	79.06	0.00	1201.86	0.102	0.11	3.336	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	63.86	63.81	174.92	0.00	1147.66	0.056	0.06	3.320	A
West	129.92	129.82	74.81	0.00	1161.92	0.112	0.13	3.487	A
South	114.51	114.42	128.72	0.00	1171.11	0.098	0.11	3.406	A
East	150.84	150.72	96.81	0.00	1191.82	0.127	0.14	3.457	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	63.86	63.86	175.06	0.00	1147.58	0.056	0.06	3.321	A
West	129.92	129.92	74.87	0.00	1161.89	0.112	0.13	3.487	A
South	114.51	114.51	128.82	0.00	1171.05	0.098	0.11	3.406	A
East	150.84	150.84	96.89	0.00	1191.78	0.127	0.14	3.457	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	52.14	52.19	143.08	0.00	1165.66	0.045	0.05	3.232	A
West	106.08	106.18	61.19	0.00	1169.36	0.091	0.10	3.385	A
South	93.49	93.58	105.28	0.00	1184.85	0.079	0.09	3.298	A
East	123.16	123.28	79.19	0.00	1201.79	0.102	0.11	3.337	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	43.67	43.70	119.80	0.00	1178.82	0.037	0.04	3.170	A
West	88.84	88.91	51.23	0.00	1174.79	0.076	0.08	3.317	A
South	78.30	78.36	88.15	0.00	1194.89	0.066	0.07	3.226	A
East	103.14	103.22	66.30	0.00	1209.07	0.085	0.09	3.257	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

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
North	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

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
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

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
North	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

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
North	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Appendix F

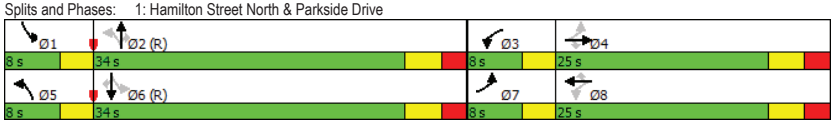
2023 Total Traffic with Remedial Measures Operations Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Future Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		25.0	50.0		25.0	40.0		25.0	40.0		25.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		0.96	0.99		0.97	1.00					0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1827	1553	1703	1727	1524	1736	1810	1524	1736	1810	1495
Flt Permitted	0.679			0.207			0.338			0.368		
Satd. Flow (perm)	1197	1827	1491	368	1727	1481	615	1810	1524	672	1810	1450
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			127			127			127			127
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	6		15	15		6	7					7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Adj. Flow (vph)	99	443	97	90	122	113	111	400	98	282	479	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	99	443	97	90	122	113	111	400	98	282	479	140
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	8.0	15.7	15.7	8.0	15.7	15.7	8.0	32.7	32.7	8.0	30.7	30.7
Total Split (s)	8.0	25.0	25.0	8.0	25.0	25.0	8.0	34.0	34.0	8.0	34.0	34.0
Total Split (%)	10.7%	33.3%	33.3%	10.7%	33.3%	33.3%	10.7%	45.3%	45.3%	10.7%	45.3%	45.3%
Maximum Green (s)	5.0	19.3	19.3	5.0	19.3	19.3	5.0	28.3	28.3	5.0	28.3	28.3
Yellow Time (s)	3.0	3.3	3.3	3.0	3.3	3.3	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0
Flash Dont Walk (s)		18.0	18.0		17.0	17.0		17.0	17.0		15.0	15.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	26.0	19.3	19.3	26.0	19.3	19.3	37.1	29.3	29.3	38.2	31.5	31.5
Actuated g/C Ratio	0.35	0.26	0.26	0.35	0.26	0.26	0.49	0.39	0.39	0.51	0.42	0.42
v/c Ratio	0.22	0.94	0.20	0.42	0.27	0.24	0.29	0.57	0.15	0.67	0.63	0.21
Control Delay	16.1	59.4	3.8	20.6	24.3	5.2	11.4	22.2	2.5	21.9	23.3	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.1	59.4	3.8	20.6	24.3	5.2	11.4	22.2	2.5	21.9	23.3	4.9
LOS	B	E	A	C	C	A	B	C	A	C	C	A
Approach Delay		44.2			16.7			17.1			20.0	
Approach LOS		D			B			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 25.1		Intersection LOS: C	
Intersection Capacity Utilization 76.7%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Queues
1: Hamilton Street North & Parkside Drive

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	99	443	97	90	122	113	111	400	98	282	479	140
v/c Ratio	0.22	0.94	0.20	0.42	0.27	0.24	0.29	0.57	0.15	0.67	0.63	0.21
Control Delay	16.1	59.4	3.8	20.6	24.3	5.2	11.4	22.2	2.5	21.9	23.3	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.1	59.4	3.8	20.6	24.3	5.2	11.4	22.2	2.5	21.9	23.3	4.9
Queue Length 50th (m)	9.1	64.6	0.0	8.3	14.5	0.0	7.9	46.4	0.0	22.5	58.9	1.2
Queue Length 95th (m)	18.7	#120.0	7.0	17.3	28.3	9.8	15.8	74.3	6.0	#43.7	92.8	12.0
Internal Link Dist (m)		191.8			134.9			206.2			208.7	
Turn Bay Length (m)	40.0		25.0	50.0		25.0	40.0		25.0	40.0		25.0
Base Capacity (vph)	447	470	478	216	444	475	380	706	672	422	759	682
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.94	0.20	0.42	0.27	0.24	0.29	0.57	0.15	0.67	0.63	0.21

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Hamilton Street North & Parkside Drive

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Future Volume (vph)	91	408	89	83	112	104	102	368	90	259	441	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1679	1827	1491	1700	1727	1481	1733	1810	1524	1736	1810	1450
Flt Permitted	0.68	1.00	1.00	0.21	1.00	1.00	0.34	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1199	1827	1491	371	1727	1481	616	1810	1524	672	1810	1450
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)	99	443	97	90	122	113	111	400	98	282	479	140
RTOR Reduction (vph)	0	0	72	0	0	84	0	0	60	0	0	76
Lane Group Flow (vph)	99	443	25	90	122	29	111	400	38	282	479	64
Confl. Peds. (#/hr)	6		15	15		6	7					7
Heavy Vehicles (%)	7%	4%	4%	6%	10%	6%	4%	5%	6%	4%	5%	8%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	23.3	19.3	19.3	23.3	19.3	19.3	32.7	28.7	28.7	35.9	30.3	30.3
Effective Green, g (s)	23.3	19.3	19.3	23.3	19.3	19.3	32.7	28.7	28.7	35.9	30.3	30.3
Actuated g/C Ratio	0.31	0.26	0.26	0.31	0.26	0.26	0.44	0.38	0.38	0.48	0.40	0.40
Clearance Time (s)	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	398	470	383	186	444	381	328	692	583	401	731	585
v/s Ratio Prot	0.01	c0.24		c0.03	0.07		0.02	0.22		c0.05	0.26	
v/s Ratio Perm	0.06		0.02	0.12		0.02	0.13		0.02	c0.28		0.04
v/c Ratio	0.25	0.94	0.07	0.48	0.27	0.08	0.34	0.58	0.06	0.70	0.66	0.11
Uniform Delay, d1	18.9	27.3	21.0	20.0	22.3	21.1	13.3	18.4	14.7	14.9	18.1	13.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	27.5	0.1	2.0	0.3	0.1	0.6	3.5	0.2	5.5	4.5	0.4
Delay (s)	19.3	54.8	21.1	21.9	22.6	21.2	14.0	21.8	14.9	20.4	22.7	14.3
Level of Service	B	D	C	C	C	C	B	C	B	C	C	B
Approach Delay (s)		44.2			21.9			19.3			20.7	
Approach LOS		D			C			B			C	

Intersection Summary

HCM 2000 Control Delay	26.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	17.4
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		

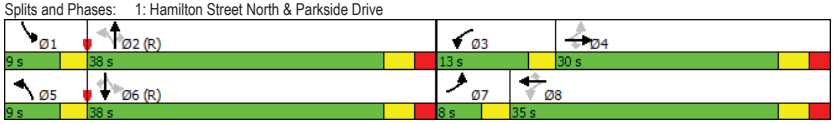
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	273	136	266	490	138	187	440	101	172	508	53
Future Volume (vph)	87	273	136	266	490	138	187	440	101	172	508	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	40.0		25.0	50.0		25.0	40.0		25.0	40.0		25.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00		0.96	0.99		0.97	1.00		0.97	1.00		0.97
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1615	1805	1845	1583	1752	1881	1568	1770	1863	1583
Flt Permitted	0.177			0.339			0.190			0.281		
Satd. Flow (perm)	329	1863	1557	639	1845	1539	349	1881	1522	522	1863	1529
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			142			105			142			142
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		215.8			158.9			230.2			232.7	
Travel Time (s)		15.5			11.4			16.6			16.8	
Confl. Peds. (#/hr)	5		10	10		5	7		5	5		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Adj. Flow (vph)	95	297	148	289	533	150	203	478	110	187	552	58
Shared Lane Traffic (%)												
Lane Group Flow (vph)	95	297	148	289	533	150	203	478	110	187	552	58
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.6			3.6			3.6			3.6	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane								Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	20.0	20.0	5.0	20.0	20.0
Minimum Split (s)	8.0	15.7	15.7	8.0	15.7	15.7	8.0	32.7	32.7	8.0	30.7	30.7
Total Split (s)	8.0	30.0	30.0	13.0	35.0	35.0	9.0	38.0	38.0	9.0	38.0	38.0
Total Split (%)	8.9%	33.3%	33.3%	14.4%	38.9%	38.9%	10.0%	42.2%	42.2%	10.0%	42.2%	42.2%
Maximum Green (s)	5.0	24.3	24.3	10.0	29.3	29.3	6.0	32.3	32.3	6.0	32.3	32.3
Yellow Time (s)	3.0	3.3	3.3	3.0	3.3	3.3	3.0	3.3	3.3	3.0	3.3	3.3
All-Red Time (s)	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		10.0	10.0		10.0	10.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		18.0	18.0		17.0	17.0		17.0	17.0		15.0	15.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	29.7	22.0	22.0	37.7	28.6	28.6	43.7	34.4	34.4	43.0	34.0	34.0
Actuated g/C Ratio	0.33	0.24	0.24	0.42	0.32	0.32	0.49	0.38	0.38	0.48	0.38	0.38
v/c Ratio	0.51	0.65	0.30	0.73	0.91	0.27	0.75	0.67	0.16	0.56	0.78	0.09
Control Delay	25.5	37.4	7.0	30.0	51.4	9.4	34.4	29.4	2.5	20.7	35.2	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.5	37.4	7.0	30.0	51.4	9.4	34.4	29.4	2.5	20.7	35.2	0.3
LOS	C	D	A	C	D	A	C	C	A	C	D	A
Approach Delay		27.0			38.5			27.0			29.3	
Approach LOS		C			D			C			C	

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green		
Natural Cycle: 90		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.91		
Intersection Signal Delay: 31.2	Intersection LOS: C	
Intersection Capacity Utilization 84.9%	ICU Level of Service E	
Analysis Period (min) 15		

Splits and Phases: 1: Hamilton Street North & Parkside Drive



Queues
1: Hamilton Street North & Parkside Drive

2023 Total PM - Remedial
609 & 615 Hamilton St N and 3 Nisbet Blvd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	95	297	148	289	533	150	203	478	110	187	552	58
v/c Ratio	0.51	0.65	0.30	0.73	0.91	0.27	0.75	0.67	0.16	0.56	0.78	0.09
Control Delay	25.5	37.4	7.0	30.0	51.4	9.4	34.4	29.4	2.5	20.7	35.2	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.5	37.4	7.0	30.0	51.4	9.4	34.4	29.4	2.5	20.7	35.2	0.3
Queue Length 50th (m)	9.8	46.9	0.8	33.7	91.1	5.6	20.5	73.7	0.0	18.6	90.1	0.0
Queue Length 95th (m)	19.2	73.7	15.1	#54.6	#151.3	19.3	#47.8	110.3	6.6	31.6	#146.0	0.0
Internal Link Dist (m)		191.8			134.9			206.2			208.7	
Turn Bay Length (m)	40.0		25.0	50.0		25.0	40.0		25.0	40.0		25.0
Base Capacity (vph)	188	503	524	397	600	571	272	718	669	335	704	666
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.59	0.28	0.73	0.89	0.26	0.75	0.67	0.16	0.56	0.78	0.09

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Hamilton Street North & Parkside Drive

2023 Total PM - Remedial
609 & 615 Hamilton St N and 3 Nisbet Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	273	136	266	490	138	187	440	101	172	508	53
Future Volume (vph)	87	273	136	266	490	138	187	440	101	172	508	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1769	1863	1557	1800	1845	1539	1751	1881	1522	1768	1863	1529
Flt Permitted	0.18	1.00	1.00	0.34	1.00	1.00	0.19	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	330	1863	1557	642	1845	1539	351	1881	1522	524	1863	1529
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)	95	297	148	289	533	150	203	478	110	187	552	58
RTOR Reduction (vph)	0	0	106	0	0	72	0	0	69	0	0	36
Lane Group Flow (vph)	95	297	42	289	533	78	203	478	41	187	552	22
Confl. Peds. (#/hr)	5		10	10		5	7		5	5		7
Heavy Vehicles (%)	2%	2%	0%	0%	3%	2%	3%	1%	3%	2%	2%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	26.6	22.6	22.6	35.6	28.6	28.6	40.4	33.8	33.8	39.6	33.4	33.4
Effective Green, g (s)	26.6	22.6	22.6	35.6	28.6	28.6	40.4	33.8	33.8	39.6	33.4	33.4
Actuated g/C Ratio	0.30	0.25	0.25	0.40	0.32	0.32	0.45	0.38	0.38	0.44	0.37	0.37
Clearance Time (s)	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	161	467	390	382	586	489	260	706	571	316	691	567
v/s Ratio Prot	0.03	0.16		c0.08	c0.29		c0.06	0.25		0.04	c0.30	
v/s Ratio Perm	0.15		0.03	0.21		0.05	0.29		0.03	0.22		0.01
v/c Ratio	0.59	0.64	0.11	0.76	0.91	0.16	0.78	0.68	0.07	0.59	0.80	0.04
Uniform Delay, d1	24.8	30.0	25.9	20.8	29.5	22.1	18.3	23.5	18.0	17.2	25.3	18.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.7	2.8	0.1	8.3	18.0	0.2	14.1	5.2	0.2	3.0	9.4	0.1
Delay (s)	30.5	32.9	26.1	29.1	47.5	22.2	32.4	28.7	18.3	20.2	34.7	18.2
Level of Service	C	C	C	C	D	C	C	C	B	C	C	B
Approach Delay (s)		30.6			38.1			28.2			30.1	
Approach LOS		C			D			C			C	

Intersection Summary				
HCM 2000 Control Delay	32.2	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.4	
Intersection Capacity Utilization	84.9%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group