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13030 Lundy's Lane, Thorold, ON Transportation Impact Study

Paradigm Transportation Solutions Limited

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Project Summary



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Client
Rudanco Hospitality Corp.
c/o Rudanco Hospitality Corp.
1827 Will Scarlet Drive
Mississauga ON L5K 1J6

Client Contact
Peter Horn

13030 Lundy's Lane, Thorold, ON Transportation Impact Study



Consultant Project Team
Stew Elkins, BES
Scott Catton, C.E.T.
Andrew Evans, M.Sc.
Matt Brouwer, P.Eng.

Matt Brouwer, P.Eng.

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**Paradigm Transportation
Solutions Limited**
5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684
www.ptsl.com

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Executive Summary

Content

Rudanco Hospitality Corp. retained Paradigm Transportation Solutions Limited (Paradigm) to conduct this Transportation Impact Study (TIS) for a mixed-use development located at 13030 Lundy's Lane in the City of Thorold.

The development application requires an Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA).

This TIS includes an analysis of existing traffic conditions, a description of the proposed development traffic, traffic forecasts for an opening year horizon (Year 2030), five-year horizon (Year 2035) from build-out, ten-year horizon (Year 2040) from build-out, and any recommendations required to accommodate future traffic conditions.

Development Concept

The property owner is proposing to subdivide the property into new building lots and blocks designated for highway commercial, residential, and employment land uses.

The plan of subdivision includes the following land uses:

- ▶ Single detached homes – 46 units;
- ▶ Townhomes – 263 units;
- ▶ Apartments – 1,754 units;
- ▶ Ground floor retail – 3,338 m² (35,926 sq.ft.); and
- ▶ Supermarket – 1,480 m² (15,931 sq.ft.).

Vehicle access is proposed by three new public roadways to Thorold Townline Road located approximately 155 metres, 375 metres, and 610 metres north of Lundy's Lane (Highway 20).

Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** The study area intersections are currently operating with acceptable levels of service and within capacity.



- ▶ **Development Trip Generation:** The overall development at full build-out is forecast to generate 817 new trips in the AM peak hour and 1,043 new trips in the PM peak hour.
- ▶ **Background Traffic Forecast:** The future traffic volumes are estimated to consist of:
 - Generalized background traffic growth – estimated to be 2% per annum;
 - Traffic generated by the future development of:
 - The Rolling Meadows Development – a multi-phase development located west of the subject site, consisting of primarily residential units including single-family, townhomes, medium density, and high-density units; and
 - The proposed Upper's Quarry – a quarry located on the west side of Thorold Townline Road near Beechwood Road. The preferred haul route for the quarry will direct trucks northbound on Thorold Townline Road through non-residential areas.
- ▶ **Background Traffic Operations:** As the traffic volumes increase at the study area intersections, capacity issues are exacerbated, and additional issues are identified. Capacity issues are identified at the following intersections:
 - Lundy's Lane (Highway 20) and Thorold Townline Road from year 2030
 - Lundy's Lane (Highway 20) and Barker Parkway from year 2030; and
 - Thorold Townline Road and Beaverdams Road from year 2030.
- ▶ **Total Traffic Operations:** The capacity deficiencies identified under background conditions will continue to occur with the addition of site generated traffic. Site generated traffic results in capacity deficiencies at the following intersections:
 - Lundy's Lane (Highway 20) and Thorold Townline Road from year 2030
 - Lundy's Lane (Highway 20) and Barker Parkway from year 2030; and
 - Thorold Townline Road and Beaverdams Road from year 2030.

Thorold Townline Road and Street A is forecast to operate with the minor approach at LOS E/F range and v/c ratios of 0.81 or less during the PM peak hour under total traffic conditions.



Traffic control signals are not warranted under 2040 total traffic conditions.

The two remaining proposed municipal roadway connections to Thorold Townline Road are forecast to operate at LOS C or better with v/c ratios of less than 0.45 during the AM and PM peak hours.

- ▶ **Remedial Measures:** The intersection of Thorold Townline Road and Beaverdams Road is warranted for traffic control signals during 2030 background traffic conditions. In addition, auxiliary turn lanes on all approaches should be considered, provided the expanded lane geometry can be accommodated without impacting the environmental features on the south side of Beaverdams Road. This is warranted regardless of whether the subject development is built.

A northbound left-turn lane with 40 metres of storage is warranted on Thorold Townline Road at Street A from the 2030 total horizon.

A southbound right-turn taper on Thorold Townline Road at Street A is warranted from the 2030 total horizon.

A northbound left-turn lane with 15 metres of storage is warranted on Thorold Townline Road at Street B from the 2030 total horizon. However, if the speed limit on Thorold Townline Road is reduced, a northbound left-turn lane would not be warranted.

A northbound left-turn lane with 30 metres of storage is warranted on Thorold Townline Road at Street C from the 2030 total horizon.

A southbound right-turn taper on Thorold Townline Road at Street C is warranted from the 2030 total horizon.

Recommendations

Based on the findings of this study, it is recommended that:

- ▶ The MTO/Region monitors the future traffic volumes at the study area intersections and implement the following recommended improvements when necessary:
 - Lundy's Lane (Highway 20) at Thorold Townline Road – second eastbound and westbound through lanes starting from the 2030 background horizon;
 - Lundy's Lane (Highway 20) at Barker Parkway – widening of the roundabout and the eastbound and westbound



approaches to two lanes starting from the 2030 background horizon; and

- Thorold Townline Road at Beaverdams Road – installation of warranted traffic control signals and auxiliary left-turn lanes (if possible) starting from the 2030 background horizon.
- ▶ A northbound left-turn lane with 40 metres of storage and a southbound right-turn taper be constructed on Thorold Townline Road when the Street A connection is established.
- ▶ A northbound left-turn lane with 30 metres of storage and a southbound right-turn taper be constructed on Thorold Townline Road when the Street C connection is established.



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1 Introduction

1.1 Overview

Rudanco Hospitality Corp. retained Paradigm Transportation Solutions Limited to conduct this Transportation Impact Study for a mixed-use development located at 13030 Lundy's Lane in the City of Thorold.

The development application requires an Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA).

Figure 1.1 illustrates the site location.

The scope of the study includes:

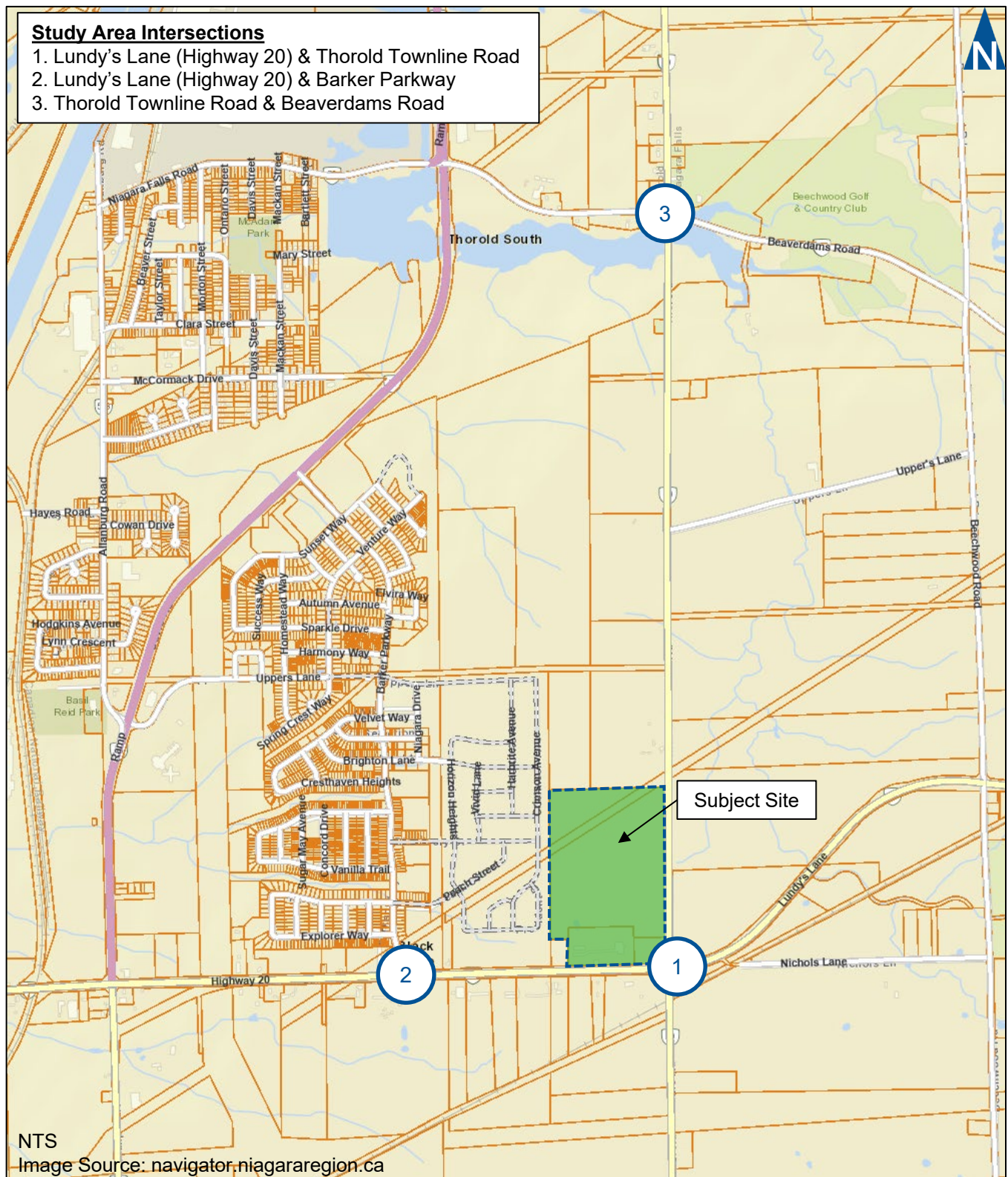
- ▶ Assessment of the current traffic and site conditions within the study area;
- ▶ Estimates of background traffic growth for each phase of development, as well as five- and ten-year horizons from build-out;
- ▶ Estimates of additional traffic generated by the proposed development of the subject site;
- ▶ Analyses of the impact of the future traffic on the study area road network; and
- ▶ Identification of recommendations necessary to mitigate traffic impacts due to the site generated traffic in a satisfactory manner.

Appendix A contains the pre-study consultation material and responses from MTO, Niagara Region, and the City of Thorold. The study generally follows the MTO¹ and Niagara Region² Transportation Impact Study Guidelines.

¹ Traffic Office, Highway Operations Management, Ontario Ministry of Transportation, *General Guidelines for the Preparation of Traffic Impact Studies*, (Toronto: Queen's Printer for Ontario, March 2023).

² Niagara Region, *Guidelines for Transportation Impact Studies*, (Niagara Region, May 2012).





1.2 Study Area

The study area intersections assessed include:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road (signalized);
- ▶ Lundy's Lane (Highway 20) and Barker Parkway (single-lane roundabout);
- ▶ Thorold Townline Road and Beaverdams Road (all-way stop control); and
- ▶ The three proposed municipal road connections to Thorold Townline Road.



2 Existing Conditions

2.1 Roadway Characteristics

The roadways of interest within the study area include:

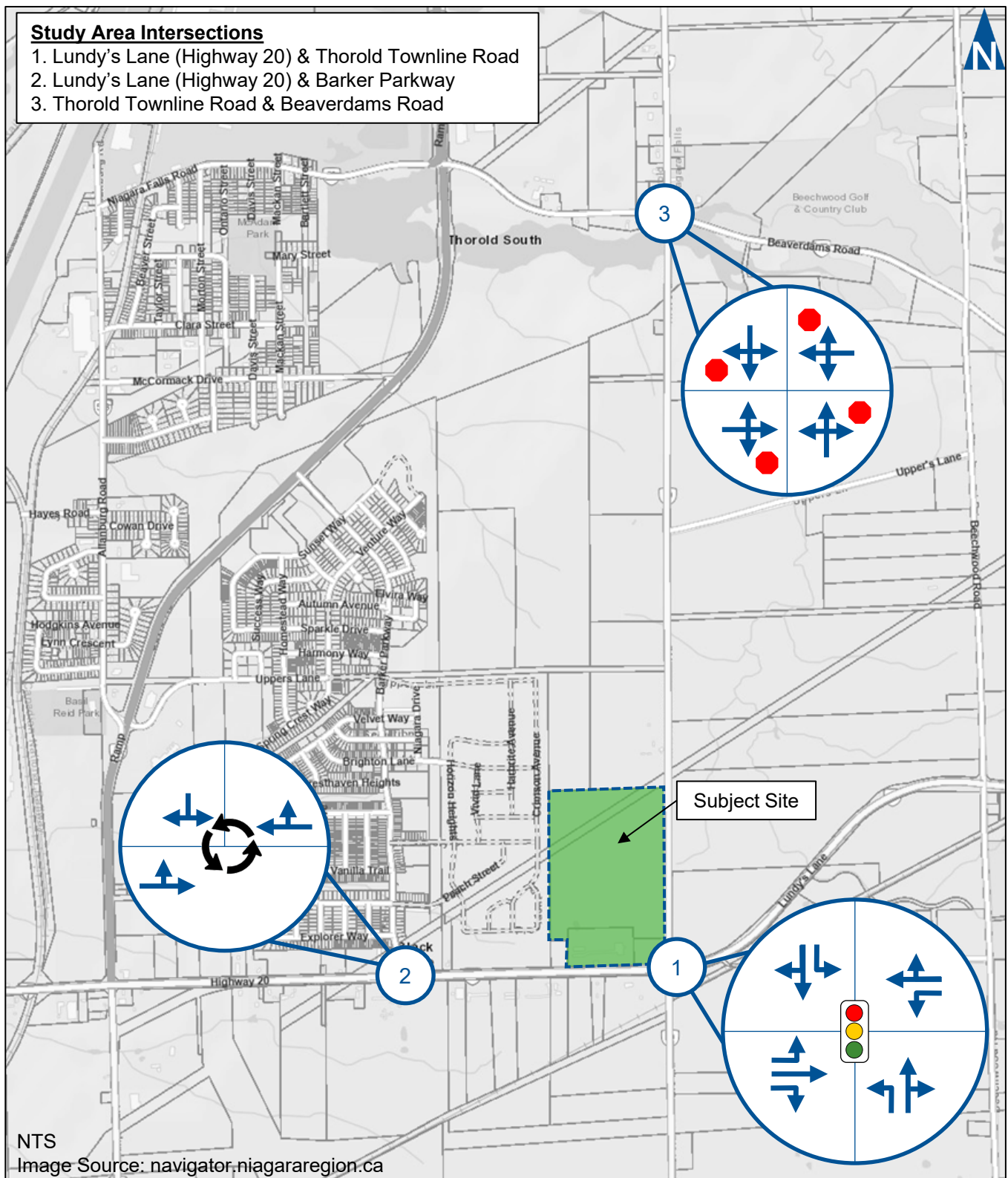
- ▶ **Lundy's Lane (Highway 20)** – Two-lane rural roadway with a posted speed limit of 80 kilometres per hour. The roadway is under the MTO's jurisdiction. The intersection with Thorold Townline Road is signalized. Along the roadway no dedicated pedestrian or cycling facilities are present.
- ▶ **Thorold Townline Road (Regional Road 70)** – Two-lane rural roadway with a posted speed limit of 80 kilometres per hour. The roadway is under the Niagara Region's jurisdiction. Along the roadway no dedicated pedestrian or cycling facilities are present.
- ▶ **Beaverdams Road** – Two-lane rural roadway with a posted speed limit of 80 kilometres per hour. The roadway is under the Niagara Region's jurisdiction. Along the roadway no dedicated pedestrian or cycling facilities are present.
- ▶ **Barker Parkway** – Two-lane urban collector road with a speed limit of 50 kilometers per hour. The roadway is under the City of Thorold's jurisdiction. Along the roadway no dedicated pedestrian or cycling facilities are present.

Figure 2.1 illustrates the existing lane configurations and traffic control at the study area intersections.



Study Area Intersections

1. Lundy's Lane (Highway 20) & Thorold Townline Road
2. Lundy's Lane (Highway 20) & Barker Parkway
3. Thorold Townline Road & Beaverdams Road



2.2 Walking

Along the study area roadways there are no dedicated pedestrian or cycling facilities present.

Walk Score is an online tool that assigns a numerical walkability score between 0 and 100 ranking communities based on how many businesses, parks, theatres, schools, and other common destinations are within walking distance.

The subject site has a Walk Score³ of 9 and is considered “Car Dependent,” which means almost all errands require a car.

2.3 Cycling

The local bicycle network provides a variety of cycling facilities within the area. **Figure 2.2** illustrates the existing cycling network.

Lundy's Lane east of Thorold Townline Road is designated as an existing cycling facility. West of Thorold Townline Road, Lundy's Lane (Highway 20) is identified as a future cycling facility. Beaverdams Road is identified as an infill link on municipal road or other corridor.

The strategic cycling network places short-term priority on building the connections that are most likely to be used based on existing network, infill opportunities, and planned capital investments.

³ <https://www.walkscore.com/score/13030-lundys-ln-thorold-on-canada>





2.4 Transit Service

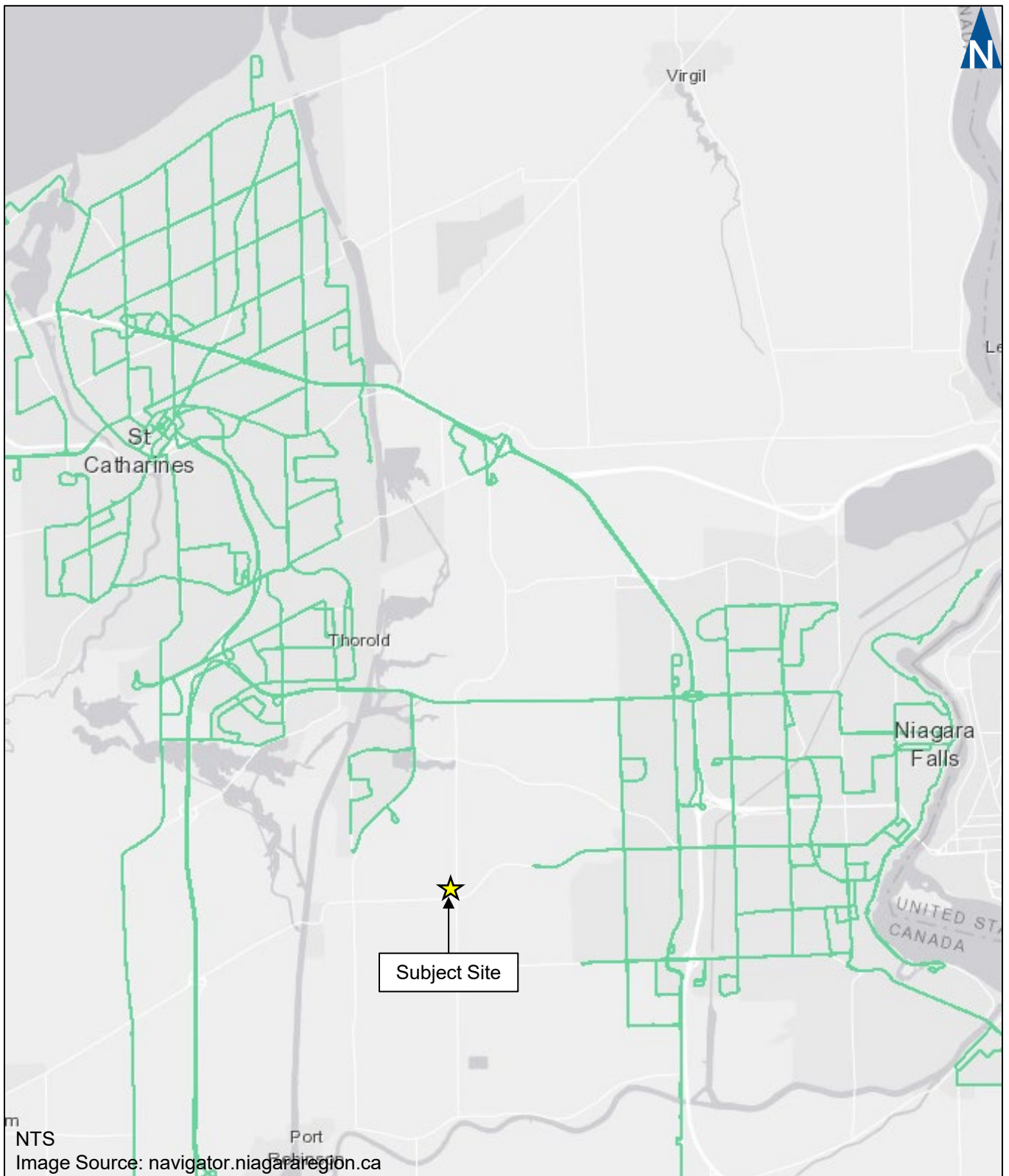
Niagara Region Transit provides transit services within the St. Catharines and Thorold. The closest service is route 322 (Thorold South) which runs from the Barker Parkway and Davis Road intersections to the Towpath Terminal with 60-minute headways Monday to Saturday. This stop is approximately 1.83 km from the northwest corner of the subject site.

Niagara Region Transit also provides service in Niagara Falls. This route is operated by 601 (WEGO Red Line) which turnarounds at the Campark Resorts on Lundy's Lane approximately 1.70 km east of Thorold Townline Road. This route operates seven days a week with headways approximately every 30 minutes.

The study area is currently lacking in public transport options. It is recommended that Niagara Region Transit look to extend transit lines out to this area upon full build-out of the subject site and the Rolling Meadows community to reduce the need for private automobile use.

Figure 2.3 illustrates the existing transit network.





2.5 Traffic Volumes

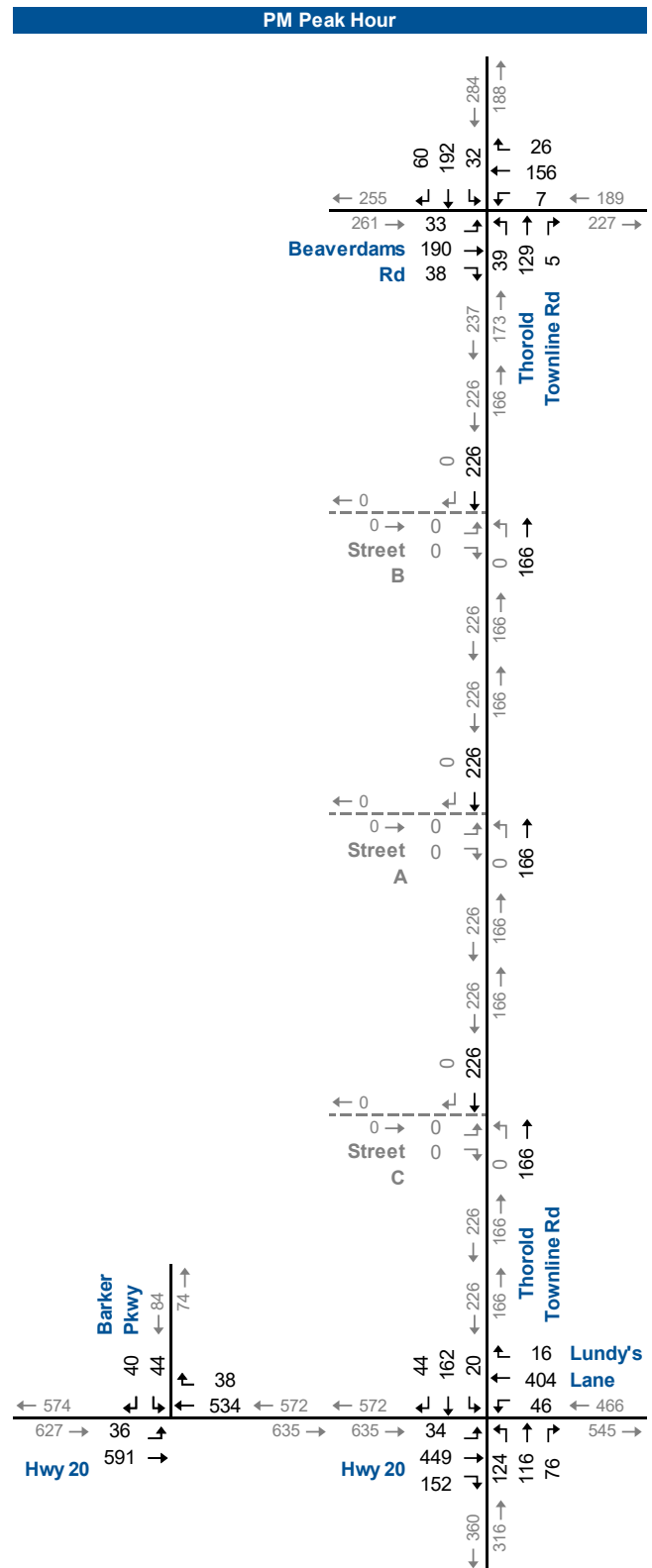
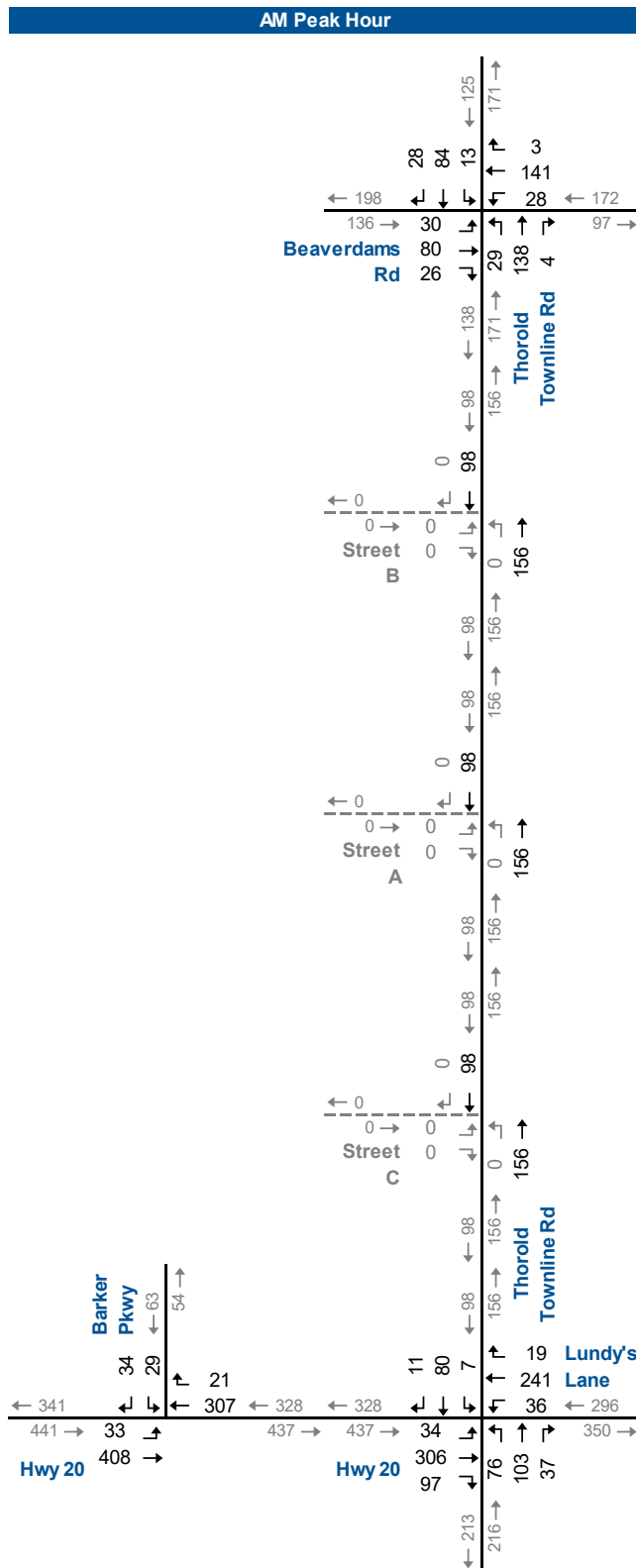
Table 2.1 summarizes the location and date of the existing turning movement count (TMC) data used in the analysis. The data was collected by Paradigm with the traffic signal timing plans provided by Niagara Region. **Appendix B** contains the existing count data and signal timing plans.

TABLE 2.1: TURNING MOVEMENT COUNT SUMMARY

Intersection	Date
Lundy's Lane (Highway 20) & Thorold Townline Road	Wednesday July 12, 2023
Lundy's Lane (Highway 20) & Barker Parkway	Thursday August 10, 2023
Thorold Townline Road & Beaverdams Road	Wednesday July 12, 2023

The turning movement counts were conducted during the summer months which is the preferred timing of Niagara Region. **Figure 2.4** illustrates the base year weekday AM and PM peak hour traffic volumes.





Base Year Traffic Volumes

2.6 Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the efficiency of 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 movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to the opposing traffic flows. The highest possible rating is LOS A, under which the average total delay is equal or less than 10 seconds per vehicle. When the average delay exceeds 80 seconds at signalized intersections (50 seconds at unsignalized), the movement is considered to have a LOS F and remedial measures are usually implemented if they are feasible.

The operations of the study area intersections were evaluated under existing traffic conditions using Synchro 11 software and Highway Capacity Manual (HCM) 2000 procedures, SimTraffic 11 (five iterations of 15-minute seed time and 60-minute evaluation time), and ACRADY roundabout procedures.

The intersection analysis considered the following measures of performance:

- ▶ The LOS for each turning movement. LOS is based on the average control delay per vehicle;
- ▶ The volume to capacity ratio (v/c) for each intersection; and
- ▶ 95th percentile queue length (m) as provided by Synchro.

Under the Region's TIS Guidelines, the following criteria identifies critical conditions and signify that mitigation measures may need to be considered:

- ▶ At signalized intersections,
 - Overall intersection operations, through movements, or shared through/turning movements increased to 0.85 or above; and
 - Volume to capacity ratios for exclusive movements increased to 0.90 or above.
- ▶ At unsignalized intersections,
 - LOS, based on average delay per vehicle, on individual movements exceeds LOS "D"; or
 - The estimated 95th percentile length for an individual movement exceeds the available queue storage.



The MTO TIS Guidelines stipulates the critical threshold for signalized intersections is a v/c ratio threshold of 0.85 for the consideration of mitigation measures.

Table 2.2 summarizes the operational results. The following critical movements are noted:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road:
 - Eastbound right-turn lane with queue reach exceeding available storage during the AM and PM peak hours; and
 - Northbound left-turn lane with queue reach exceeding available storage during the AM and PM peak hours.

Appendix C contains the supporting detailed Synchro reports.



TABLE 2.2: BASE YEAR OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	A 4 0.80 15 90 75	A 5 0.37 44 - -	A 5 0.12 22 20 -2	A 5	A 4 0.09 15 55 40	A 6 0.37 35 - -	> > > > > >	A 5	B 15 0.39 27 20 -7	B 16 0.46 28 - -	> > > > > >	B 16	B 13 0.06 12 20 8	B 15 0.32 30 - -	> > > > > >	B 15	A 8
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	A 9 0.21 18 - -	> > > > >	A 9	< < < < <	A 10 0.26 17 - -	> > > > >	A 10	< < < < <	B 10 0.27 28 - -	> > > > >	B 10	< < < < <	A 10 0.21 24 - -	> > > > >	A 10	A 10
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				A 5 0.40 3					A 4 0.30 3								A 4 0.07 3
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	A 7 0.12 18 90 72	B 10 0.58 75 - -	A 8 0.22 42 20 -22	A 10	A 7 0.17 19 55 36	B 12 0.65 61 - -	> > > > >	B 11	B 17 0.52 38 20 -18	B 16 0.44 39 - -	> > > > >	B 16	B 13 0.80 12 20 8	B 16 0.51 49 - -	> > > > >	B 16	B 12
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	B 13 0.45 25 - -	> > > > >	B 13	< < < < <	B 12 0.34 19 - -	> > > > >	B 12	< < < < <	B 12 0.32 30 - -	> > > > >	B 12	< < < < <	B 14 0.49 33 - -	> > > > >	B 14	B 13
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				A 7 0.58 3					A 7 0.53 3								A 5 0.10 3

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



3 Development Concept

3.1 Site Description

The subject site is located at 13030 Lundy's Lane on the northwest corner of Thorold Townline Road and Lundy's Lane (Highway 20) in the City of Thorold. The site is located within the MTO permit control area.

The property owner is proposing to subdivide the property into new building lots and blocks designated for highway commercial, residential, and employment land uses.

The draft plan of subdivision includes the following land uses:

- ▶ Single detached homes – 46 units;
- ▶ Townhomes – 263 units;
- ▶ Apartments – 1,752 units;
- ▶ Ground floor retail – 3,338 m² (35,926 sq.ft.); and
- ▶ Supermarket – 1,480 m² (15,931 sq.ft.).

Vehicle access is illustrated by three new public roadways to Thorold Townline Road located approximately 155 metres, 375 metres, and 610 metres north of Lundy's Lane (Highway 20).

Street A would be located approximately 50 metres north of the private driveway to 6200 Thorold Townline Road on the east side of the roadway. There are no further existing private driveways opposite the subject site on Thorold Townline Road.

Street A is planned to connect to the Rolling Meadow Subdivision, which is located to the west of the site, via Discovery Drive.

Street B is planned to connect to Thorold Townline Road approximately 235 metres north of Street A. There are no existing driveways near the proposed location of Street B.

Another connection to the Rolling Meadows is proposed via Street F. Street F is planned to connect to Horizon Heights. This will provide additional access to/from the subject lands.

The full build-out date for the subject site is assumed to be Year 2030 dependent on market conditions.

Figure 3.1 illustrates the concept plan.





Discovery Dr

Horizon Heights



NTS



Concept Plan

13030 Lundy's Lane, Thorold
210565

Figure 3.1

3.2 Sight Distance

Thorold Townline Road is relatively straight and flat along the subject site frontage. There are slight dips and rises in the roadway to the north of the property. Sight distances have been reviewed to confirm if adequate sight distances are provided at the proposed municipal roadway connections to Thorold Townline Road.

The available sight distance along Thorold Townline Road and the three proposed municipal roadway connections have been assessed based on the methodology outlined in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads⁴ ("TAC Guide"). The following parameters have been referenced in the assessment:

- ▶ Object Height (Vehicle tail or brake light) – 0.60 m;
- ▶ Driver Eye Height – 1.08 m; and
- ▶ Top of Car – 1.30 m.

Table 3.1 summarizes the sight distances set out in the TAC Guide applicable to this analysis. **Appendix D** contains the sight distance assessment plots.

TABLE 3.1: TAC SIGHT DISTANCES

Sight Distance	Distance (m) 100 km/h Design Speed
Minimum Stopping Sight Distance ⁵	185 m
Intersection Sight Distance – Right-Turn from Stop ⁶	185 m
Intersection Sight Distance – Left-Turn from Stop ⁷	210 m

No sight distance issues are identified on Thorold Townline Road at the proposed three municipal roadway connections. The three roadway's location onto Thorold Townline Road meets the prescribed sight distances set out in the TAC Guide for a design speed of 100 km/h.

⁴ Transportation Association of Canada, *Geometric Design Guide for Canadian Roads*, (Ottawa: TAC, 2017).

⁵ Ibid. Table 2.5.2: *Stopping Sight Distance on Level Roadways for Automobiles*.

⁶ Ibid. Table 9.9.6: *Design Intersection Sight Distance – Case B2, Right Turn from Stop*.

⁷ Ibid. Table 9.9.4: *Design Intersection Sight Distance – Case B1, Left Turn From Stop Design*.



3.3 Site Traffic Generation

The Institute of Transportation Engineers (ITE) publication, *Trip Generation*⁸ has been referenced to estimate the site trip generation. The following land use codes were used to estimate the site's trip generation:

- ▶ 210 – Single Family, Detached Housing (Dwelling Units);
- ▶ 220 – Multifamily Housing, Low-Rise (Dwelling Units);
- ▶ 221 – Multifamily Housing, Mid-Rise (Dwelling Units);
- ▶ 222 – Multifamily Housing, High-Rise (Dwelling Units);
- ▶ 822 – Strip Retail Plaza, <40k (GFA/1,00 sq.ft.); and
- ▶ 850 – Supermarket (GFA/1,000 sq.ft.).

Table 3.2 summarizes the estimated trip generation for the development. The highest number of calculated trips by use of the average rate or the linear equation has been taken to estimate the trip generation. No reductions for modal split were calculated to represent a conservative trip generation estimate.

Upon full build-out, the site is estimated to generate approximately 817 AM peak hour trips and approximately 1,043 PM peak hour trips.

It is noted that pass-by trips for the commercial land uses in the PM peak hour were obtained from Land Use Code 820 (Shopping Centre) and Land Use Code 850 (Supermarket) from the ITE *Trip Generation Handbook*⁹. The pass-by trips for LUC 820 were used as they have similar land use characteristics as LUC 822 (Strip Plaza, <40K). The resulting net trip generation is approximately 817 AM peak hour trips and approximately 1,077 PM peak hour trips.

⁸ Institute of Transportation Engineers, *Trip Generation Manual*, 11th ed., (Washington, DC: ITE, 2021).

⁹ Institute of Transportation Engineers, *Trip Generation Handbook*, 3rd ed., (Washington, DC: ITE, 2017).



TABLE 3.2: ESTIMATED TRIP GENERATION

ITE Land Use	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
210 - Single Family, Detached Housing (Dwelling Units)	46	8	24	32	27	16	43
220 - Multifamily Housing, Low-Rise (Dwelling Units)	263	25	80	105	84	50	134
221 - Multifamily Housing, Mid-Rise (Dwelling Units)	750	64	214	278	179	114	293
222 - Multifamily Housing, High-Rise (Dwelling Units)	1002	70	201	271	199	122	321
822 - Strip Retail Plaza (<40k) (GFA/1,000ft ²)	35.9	51	34	85	118	119	237
850 - Supermarket (GFA/1,000ft ²)	15.9	27	19	46	71	72	143
Total Trip Generation		245	572	817	678	493	1,171
821 Pass-by AM Peak Hour	0%	-	-	-	-	-	-
821 Pass-by PM Peak Hour	40%	-	-	-	47	47	94
850 Pass-by AM Peak Hour	0%	-	-	-	-	-	-
850 Pass-by PM Peak Hour	24%	-	-	-	17	17	34
Net Trip Generation		245	572	817	614	429	1,043



The site generated trips were assigned to the road network based on a review of existing traffic patterns at the study intersections as noted in the pre-study consultation.

Table 3.3 summarizes the estimated trip distribution.

TABLE 3.3: ESTIMATED TRIP DISTRIBUTION

Route	To/From	
	AM Peak Hour	PM Peak Hour
Thorold Townline Road (North)	11%	11%
Beaverdams Road (West)	13%	12%
Beaverdams Road (East)	10%	10%
Lundy's Lane (East)	24%	24%
Thorold Townline Road (South)	16%	16%
Highway 20 (West)	26%	27%
Total	100%	100%

The new site generated trips have been assigned using the most logical path to/from their destinations. For example, all trips to the north west have been assigned to the collector roads (Discovery Drive and Barker Parkway) to Davis Road. All site trips to/from Highway 20 have been assigned to Barker Parkway and the Rolling meadows internal roadways.

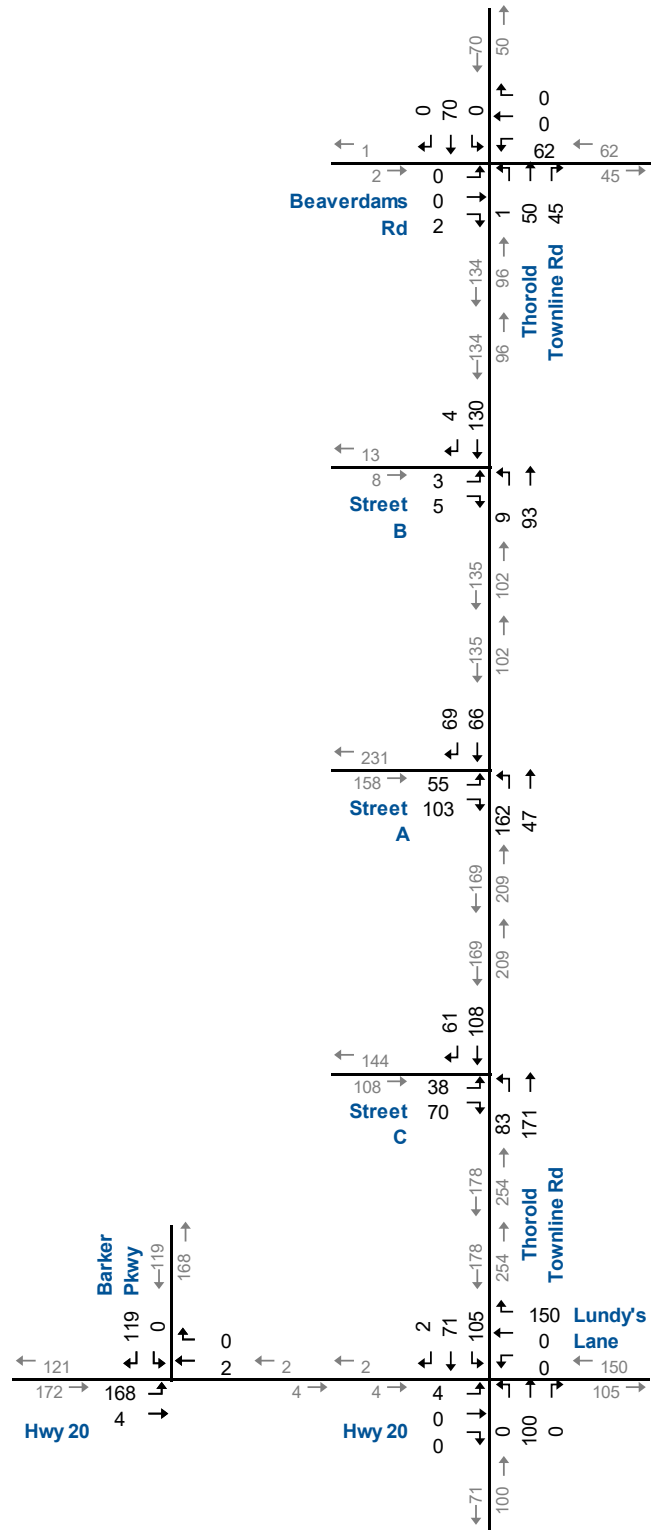
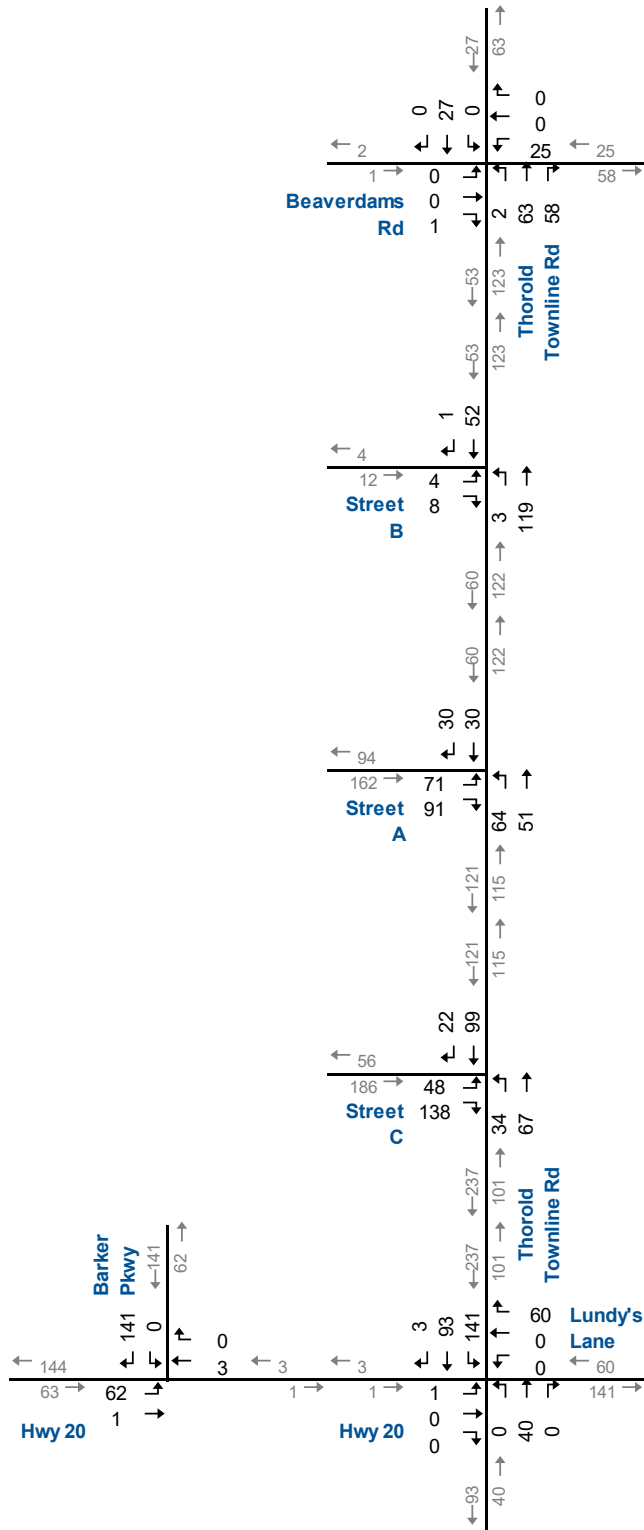
Figure 3.2 illustrates the site generated traffic volumes for the weekday AM and PM peak hours.

Figure 3.3 illustrates the pass-by volumes assignment.



AM Peak Hour

PM Peak Hour



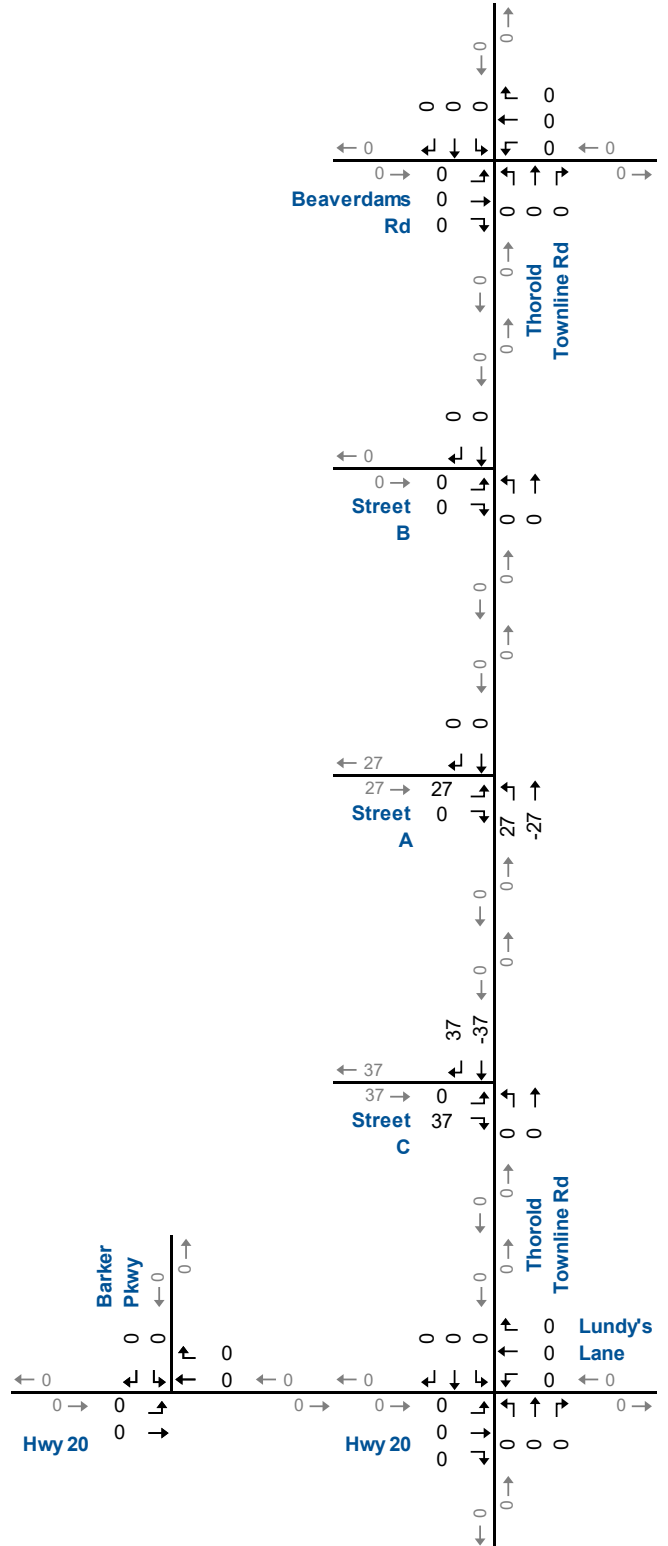
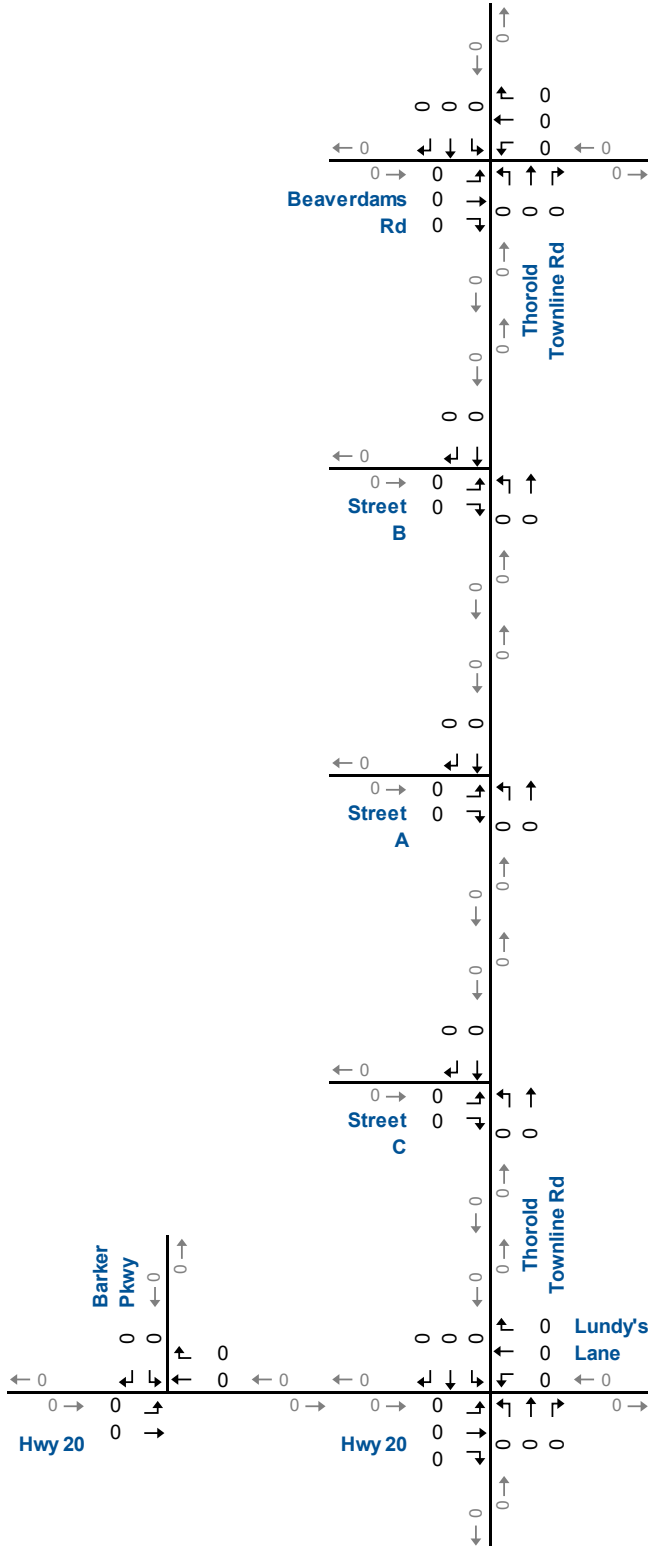
Site Generated Traffic Volumes

13030 Lundy's Lane, Thorold
210565

Figure 3.2

AM Peak Hour

PM Peak Hour



4 Future Traffic Conditions

The assessment of future traffic conditions includes the following components necessary to assess the traffic implications on the adjacent road network:

- ▶ Future background traffic estimates;
- ▶ Level of service analysis for background traffic (pre-development);
- ▶ Future total traffic estimates; and
- ▶ Level of service analysis for total traffic (post-development).

The horizon years assessed include:

- ▶ Year 2030 representing the full build-out of the development;
- ▶ Year 2035 representing a period of five years from full build-out; and
- ▶ Year 2040 representing a period of ten years from full build-out.

4.1 Forecast Traffic Volumes

The future traffic volumes are estimated to consist of:

- ▶ Increased non-site traffic (generalized background traffic growth) estimated to be 2% per annum¹⁰
- ▶ Traffic generated by the future development of:
 - Rolling Meadows¹¹ – a multi-phase residential development covering an area of approximately 160 hectares north of Highway 20 and east of Davis Road consisting of primarily residential units including single-family, townhomes, medium density, and high-density units; and
 - Upper's Quarry¹² – a 96.8-hectare quarry located on the west side of Thorold Townline Road near Beechwood Road. The quarry is anticipated to have an annual extraction limit of 1.8 million tonnes of aggregate and a maximum annual production of 400,000 tonnes of asphalt.

The preferred Haul Route for the quarry is Haul Route Option 1 which will direct trucks northbound on Thorold

¹⁰ Growth rate confirmed by Regional Staff in initial pre-study consultation.

¹¹ AECOM, *Rolling Meadows Development Traffic Impact Study*, (AECOM: Upper Canada Planning & Engineering Ltd, February 2019).

¹² T.Y. Lin International Canada Inc., *TIS Addendum Upper's Quarry*, (TY Lin: Walkers Aggregates Inc, March 2023).



Townline Road through a non-residential area. The October 2021 version of the supportive TIS recommended “that Walker Aggregates Inc. and the Town perform a review of the existing load capacity of Thorold Townline Road in order to determine if any upgrades are required, and if so, what cost would be associated with the upgrades.”¹³

- ▶ Traffic generated by the subject site.

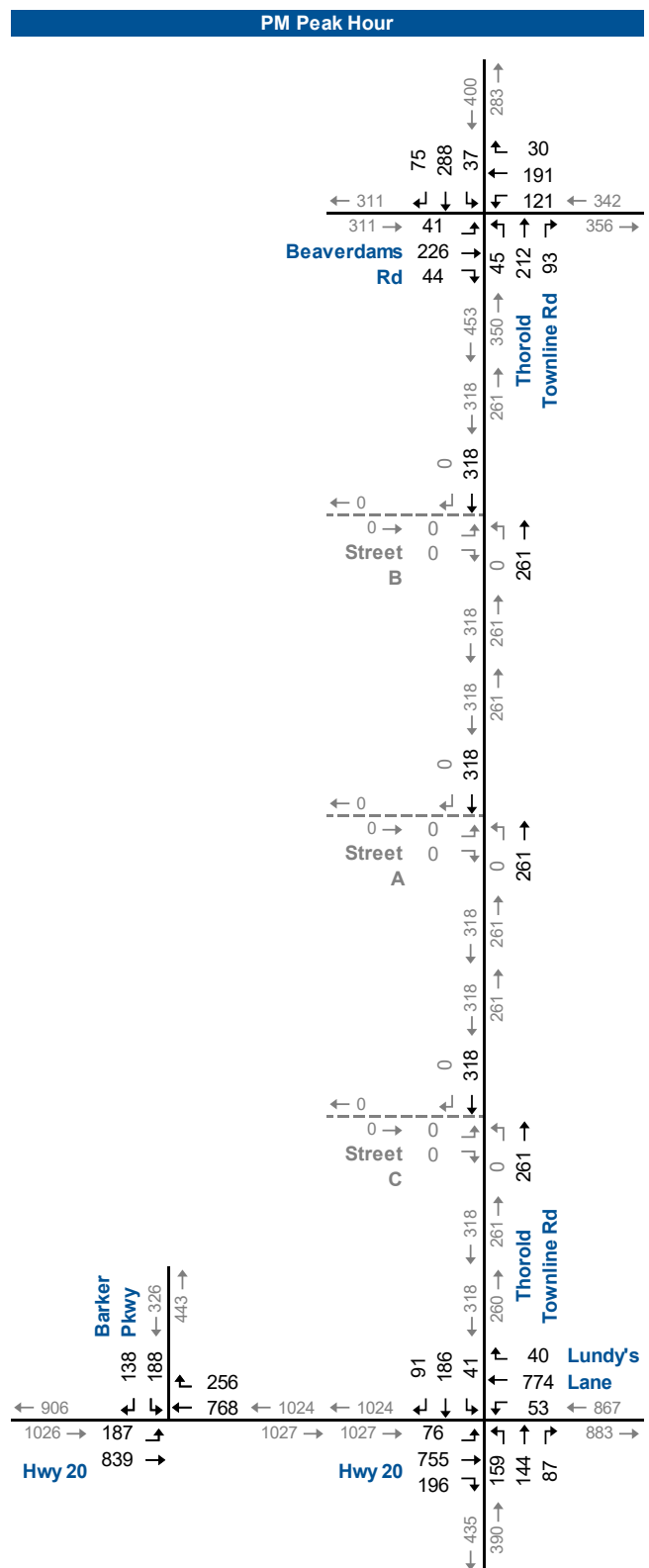
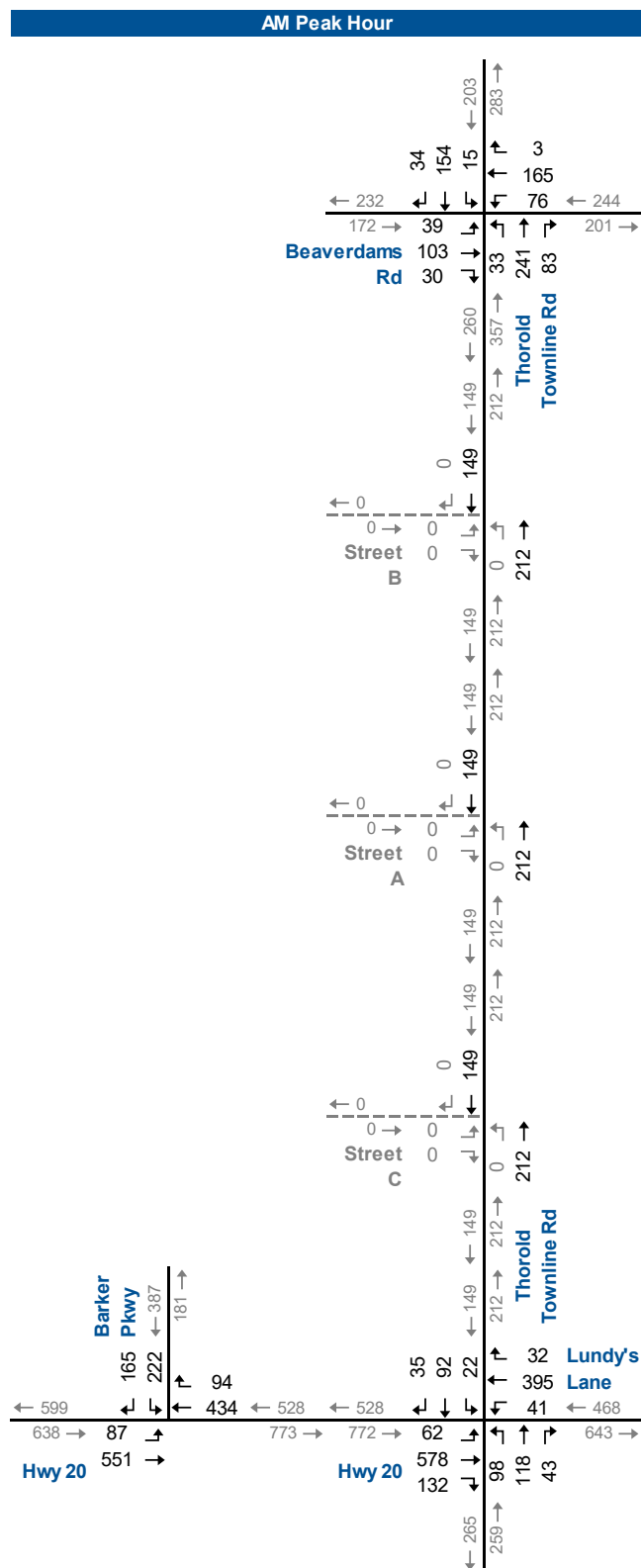
Appendix E contains the adjacent development traffic volume assignment. The traffic volumes from the adjacent developments were obtained from their respective traffic studies.

Figure 4.1 illustrates the forecast background traffic volumes for the full build-out year (2030). **Figure 4.2** illustrates the forecast background traffic volumes for the five-year horizon (2035). **Figure 4.3** illustrates the forecast background traffic volumes for the ten-year horizon (2040).

The total traffic volumes are the summation of forecast background traffic volumes and site-generated traffic volumes. **Figure 4.4** illustrates the forecast total traffic volumes for the full build-out year (2030). **Figure 4.5** illustrates the forecast total traffic volumes for the five-year horizon (2035). **Figure 4.6** illustrates the forecast total traffic volumes for the ten-year horizon (2040).

¹³ Traffic Impact Study Upper's Quarry, (The Municipal Infrastructure Group, October 2021) Executive Summary.

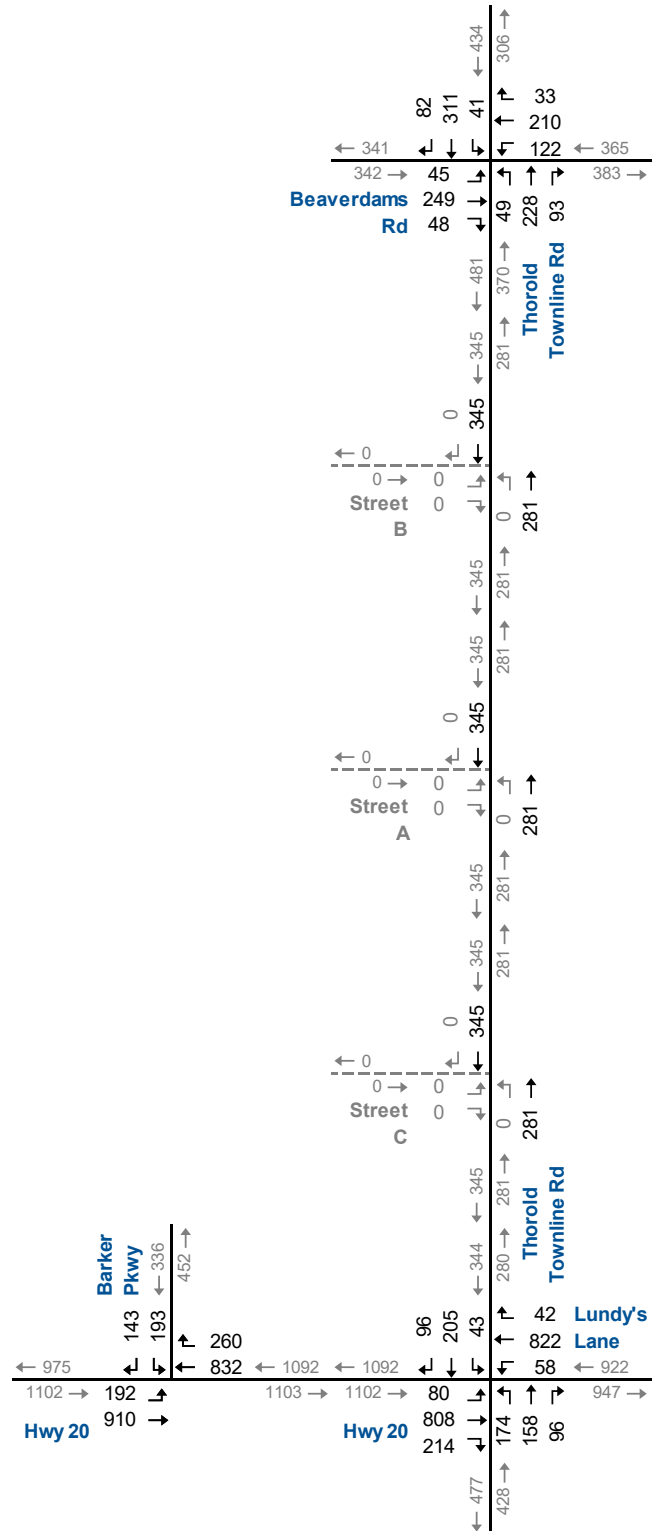
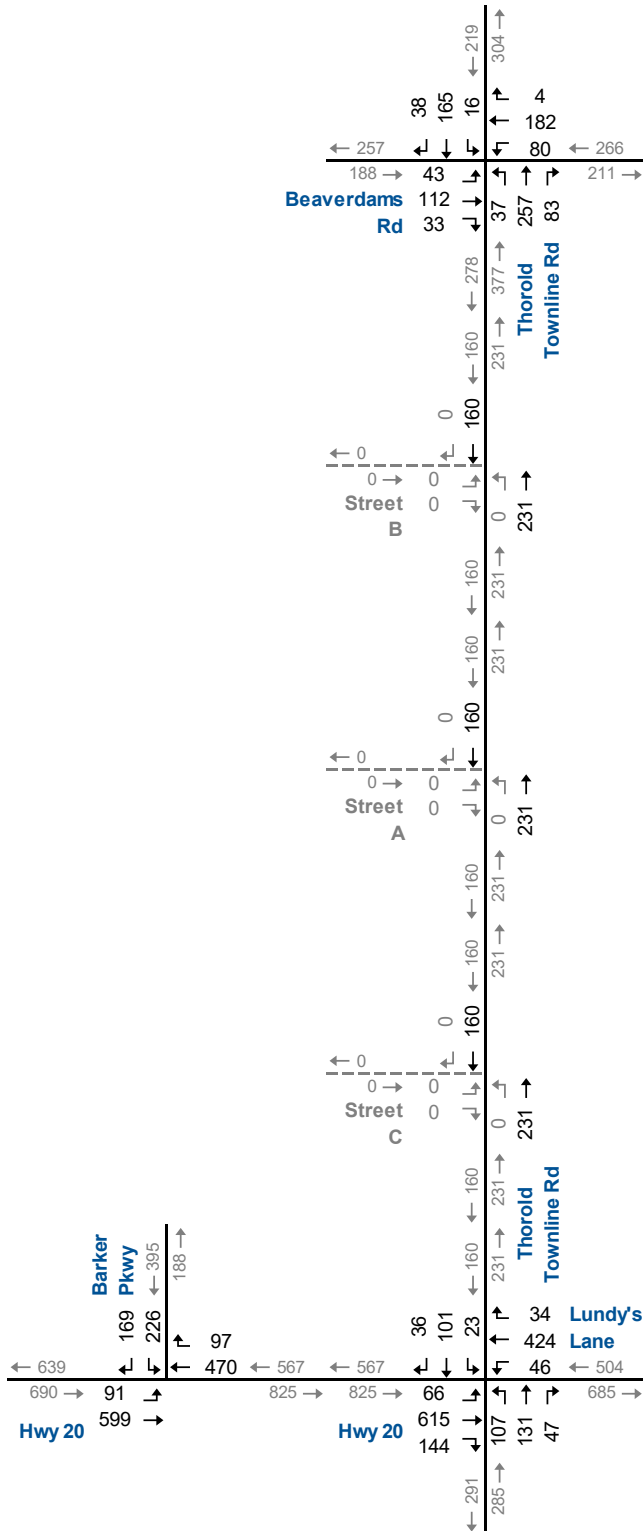




2030 Background Traffic Volumes

AM Peak Hour

PM Peak Hour



2035 Background Traffic Volumes

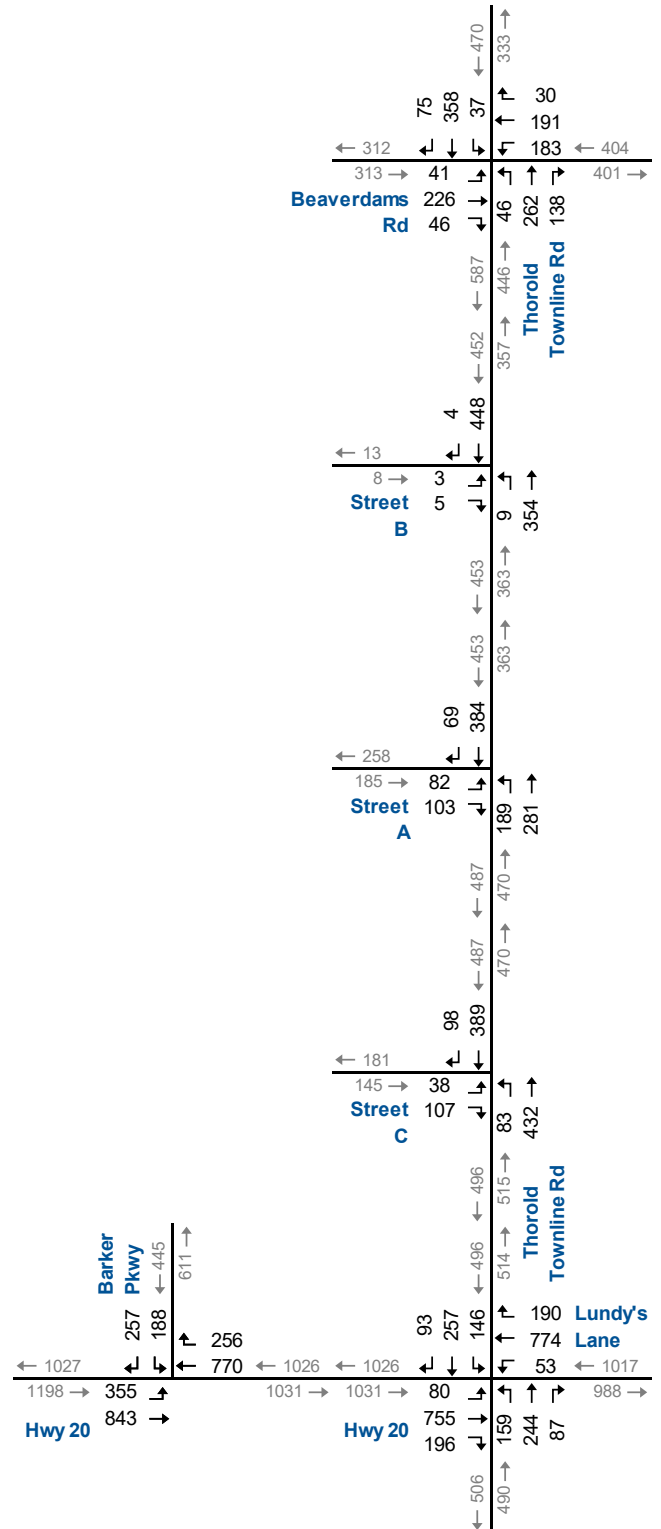
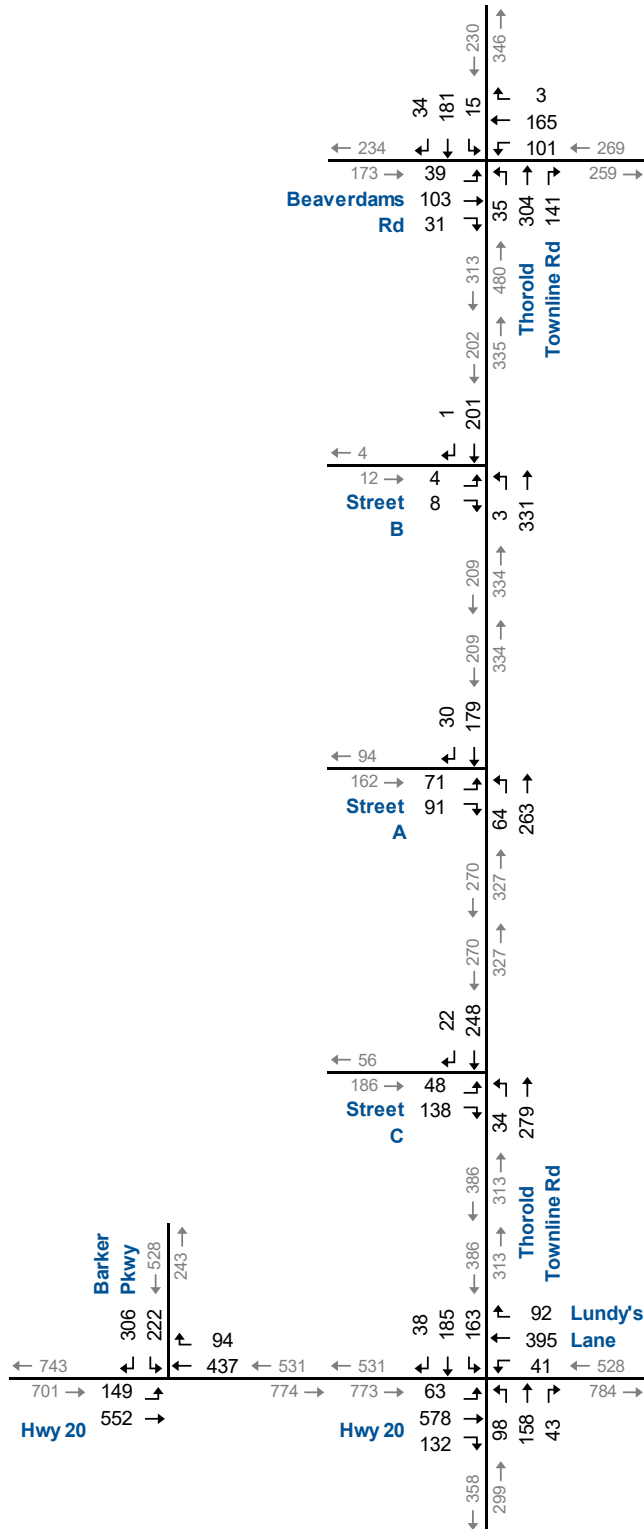
AM Peak Hour

Location	Direction	Volume
Hwy 20 (Left Side)	←	685
	→	748
	←	95
	→	653
Barker Pkwy	←	174
	→	230
	←	404
	→	194
Street C	←	0
	→	0
	←	173
	→	173
Street A	←	0
	→	0
	←	173
	→	173
Street B	←	0
	→	0
	←	173
	→	173
Thorold Townline Rd	←	251
	→	251
	←	251
	→	251
Beaverdams Rd	←	282
	→	206
	←	47
	→	123
Thorold Townline Rd	←	287
	→	225
	←	83
	→	275
Lundy's Lane	←	542
	→	731
	←	50
	→	52
Hwy 20 (Right Side)	←	319
	→	313
	←	117
	→	144
Thorold Townline Rd	←	252
	→	251
	←	251
	→	251
Street C	←	0
	→	0
	←	173
	→	173
Street A	←	0
	→	0
	←	173
	→	173
Street B	←	0
	→	0
	←	173
	→	173
Thorold Townline Rd	←	251
	→	251
	←	251
	→	251
Beaverdams Rd	←	282
	→	206
	←	47
	→	123
Thorold Townline Rd	←	287
	→	225
	←	83
	→	275
Lundy's Lane	←	542
	→	731
	←	50
	→	52
Hwy 20 (Right Side)	←	319
	→	313
	←	117
	→	144
Thorold Townline Rd	←	252
	→	251
	←	251
	→	251
Street C	←	0
	→	0
	←	173
	→	173
Street A	←	0
	→	0
	←	173
	→	173
Street B	←	0
	→	0
	←	173
	→	173
Thorold Townline Rd	←	251
	→	251
	←	251
	→	251
Beaverdams Rd	←	282
	→	206
	←	47
	→	123
Thorold Townline Rd	←	287
	→	225
	←	83
	→	275
Lundy's Lane	←	542
	→	731
	←	50
	→	52
Hwy 20 (Right Side)	←	319
	→	313
	←	117
	→	144
Thorold Townline Rd	←	252
	→	251
	←	251
	→	251
Street C	←	0
	→	0
	←	173
	→	173
Street A	←	0
	→	0
	←	173
	→	173
Street B	←	0
	→	0
	←	173
	→	173
Thorold Townline Rd	←	251
	→	251
	←	251
	→	251
Beaverdams Rd	←	282
	→	206
	←	47
	→	123
Thorold Townline Rd	←	287
	→	225
	←	83
	→	275
Lundy's Lane	←	542
	→	731
	←	50
	→	52
Hwy 20 (Right Side)	←	319
	→	313
	←	117
	→	144
Thorold Townline Rd	←	252
	→	251
	←	251
	→	251

[illegible]

AM Peak Hour

PM Peak Hour



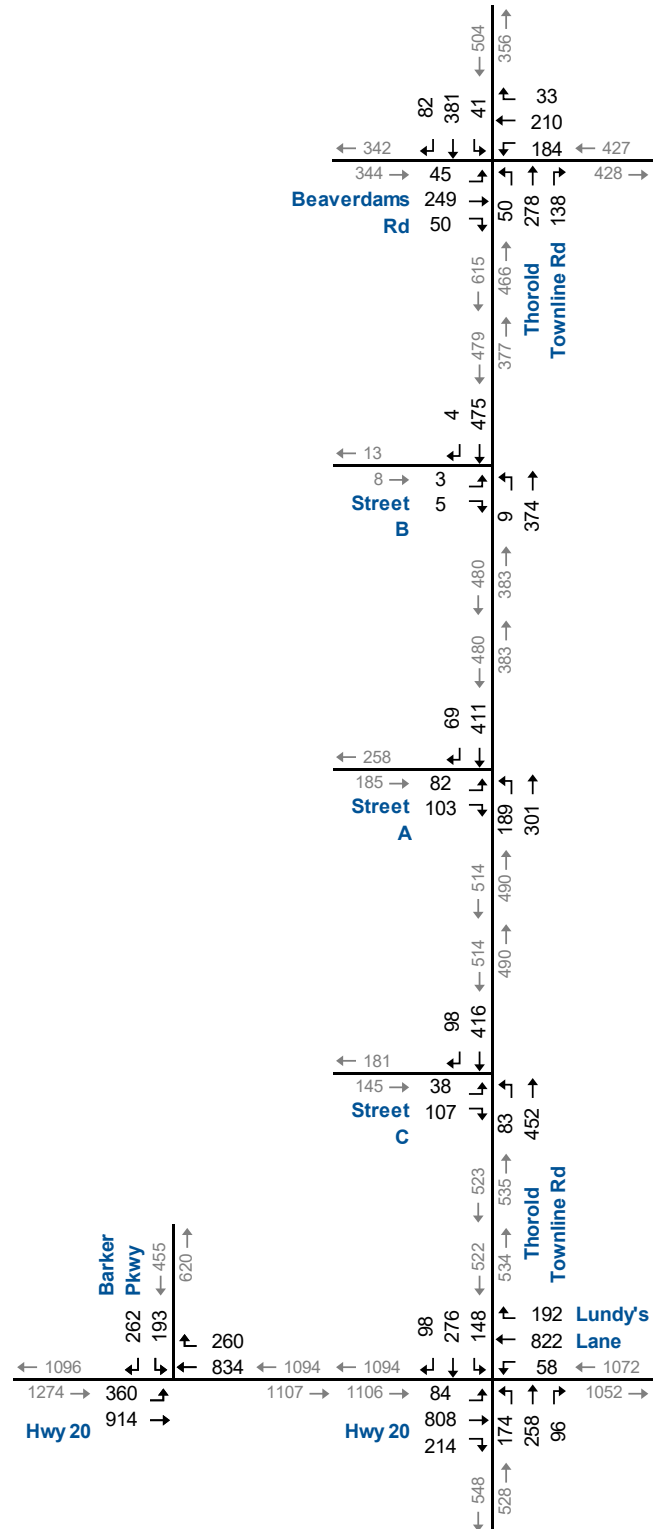
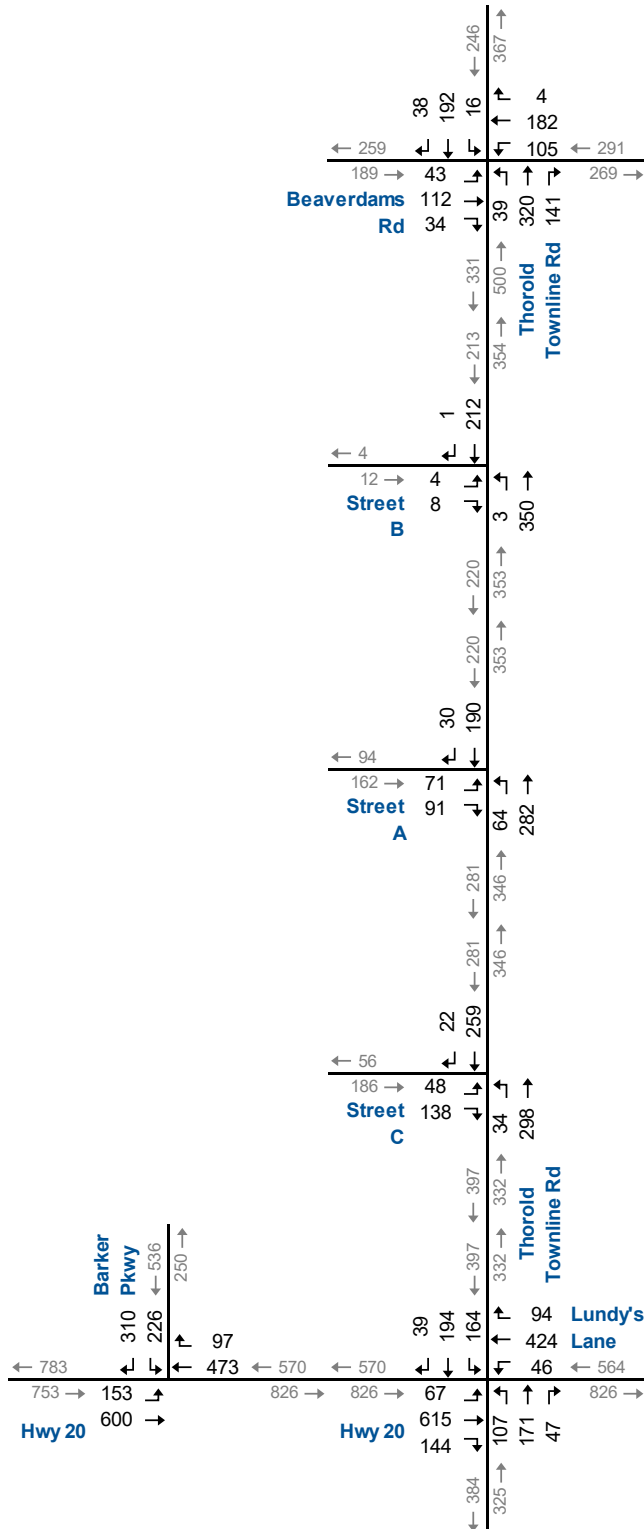
2030 Total Traffic Volumes

13030 Lundy's Lane, Thorold
210565

Figure 4.4

AM Peak Hour

PM Peak Hour



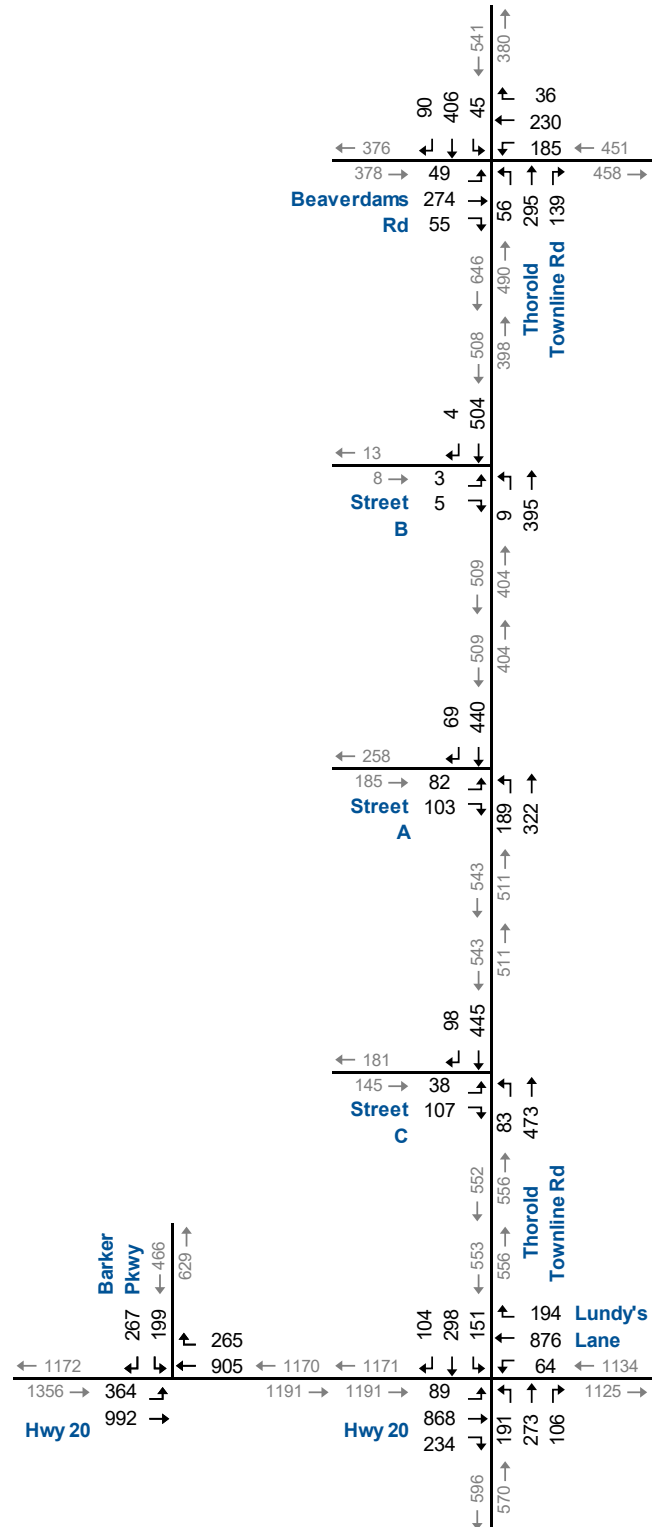
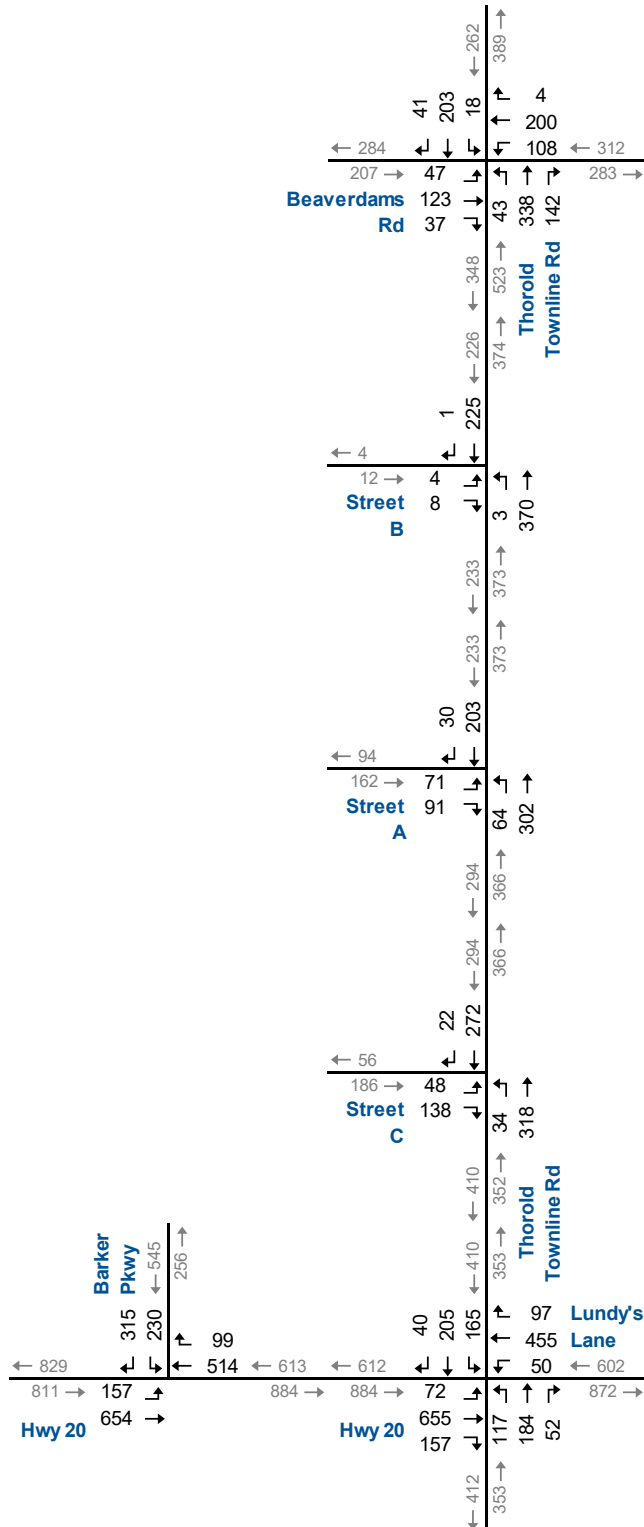
2035 Total Traffic Volumes

13030 Lundy's Lane, Thorold
210565

Figure 4.5

AM Peak Hour

PM Peak Hour



2040 Total Traffic Volumes

13030 Lundy's Lane, Thorold
210565

Figure 4.6

4.2 Background Traffic Operations

The operational analysis of background traffic conditions (without development) followed the same methodology and parameters used for existing traffic conditions.

4.2.1 Year 2030

Table 4.1 summarizes the level of service conditions for the weekday AM and PM peak hours. No changes to the existing signal timings have been assumed. The following critical movements are noted:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road
 - Eastbound through with LOS C and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound right-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Westbound through/right-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Northbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Southbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway
 - Eastbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Westbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
- ▶ Thorold Townline Road and Beaverdams Road:
 - All approaches with LOS F and v/c ratios greater than critical threshold during the PM peak hour.

Appendix F1 contains the detailed Synchro reports.



TABLE 4.1: 2030 BACKGROUND OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	A 6 0.19 21 90 69	B 12 0.71 85 - -	A 6 0.21 42 20 -22	B 10	A 7 0.19 23 55 32	B 10 0.63 56 - -	> > > > >	A 10	B 18 0.44 33 20 -13	B 17 0.46 36 - -	> > > > >	B 17	B 15 0.15 21 20 -1	B 16 0.35 34 - -	> > > > >	B 16	B 12
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	B 13 0.33 22 - -	> > > > >	B 13	< < < < <	B 15 0.46 24 - -	> > > > >	B 15	< < < < <	C 19 0.64 46 - -	> > > > >	C 19	< < < < <	B 14 0.39 33 - -	> > > > >	B 14	C 16
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				B 10 0.65 6					A 6 0.50 3								A 8 0.47 3
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	E 75 0.89 106 90 -16	C 29 0.91 219 - -	A 10 0.30 90 20 -70	C 29	B 13 0.44 173 55 -118	F 106 1.16 724 - -	> > > > >	F 100	E 58 0.87 64 20 -44	C 24 0.54 94 - -	> > > > >	D 37	B 20 0.20 26 20 -6	C 28 0.68 68 - -	> > > > >	C 27	D 53
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	F 51 0.88 50 - -	> > > > >	F 51	< < < < <	F 65 0.95 48 - -	> > > > >	F 65	< < < < <	F 67 0.96 59 - -	> > > > >	F 67	< < < < <	F 112 1.12 108 - -	> > > > >	F 112	F 76
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				F 98 1.03 274					F 92 1.02 266								A 10 0.48 3

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



4.2.2 Year 2035

Table 4.2 summarizes the level of service conditions for the weekday AM and PM peak hours. No changes to the existing signal timings have been assumed. The following critical movements are noted:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road:
 - Eastbound left-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound through with LOS D and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound right-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Westbound through/right-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Northbound left-turn with a queue reach greater than available storage during the AM. LOS E, v/c ratio greater than the critical threshold, and queue reach greater than available storage during the PM peak hour.
 - Southbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway
 - Eastbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Westbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
- ▶ Thorold Townline Road and Beaverdams Road:
 - All approaches with LOS F and v/c ratios greater than critical threshold during the PM peak hour.

Appendix F2 contains the detailed Synchro reports.



TABLE 4.2: 2035 BACKGROUND OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	A 7 0.22 25 90 65	B 13 0.75 91 - -	A 7 0.24 50 20 -30	B 12	A 7 0.23 22 55 33	B 11 0.66 66 - -	> > > > >	B 11	B 19 0.48 37 20 -17	B 19 0.50 38 - -	> > > > >	B 19	B 16 0.16 24 20 -4	B 18 0.39 41 - -	> > > > >	B 18	B 13
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	B 14 0.39 25 - -	> > > > >	B 14	< < < < <	C 17 0.53 26 - -	> > > > >	C 17	< < < < <	C 23 0.71 50 - -	> > > > >	C 23	< < < < <	C 15 0.45 37 - -	> > > > >	C 15	C 18
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				B 12 0.70 16					A 7 0.54 3								A 8 0.47 3
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	F 237 1.32 78 90 12	D 54 1.01 158 - -	B 11 0.35 92 20 -72	E 59	E 63 0.82 172 55 -117	F 160 1.29 688 - -	> > > > >	F 154	E 65 0.91 78 20 -58	C 23 0.56 167 - -	> > > > >	D 40	B 19 0.20 34 20 -14	C 28 0.69 69 - -	> > > > >	C 27	F 83
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	F 74 0.98 58 - -	> > > > >	F 74	< < < < <	F 93 1.05 73 - -	> > > > >	F 93	< < < < <	F 95 1.06 68 - -	> > > > >	F 95	< < < < <	F 162 1.25 151 - -	> > > > >	F 162	F 109
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				F 185 1.10 380					F 159 1.08 352								B 10 0.50 3

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



4.2.3 Year 2040

Table 4.3 summarizes the level of service conditions for the weekday AM and PM peak hours. No changes to the existing signal timings have been assumed. The following critical movements are noted:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road
 - Eastbound left-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound through with LOS D and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound right-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Westbound left-turn with LOS F, v/c ratio greater than the critical threshold, and queue reach greater than available storage during the PM peak hour.
 - Westbound through/right-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Northbound left-turn with a queue reach greater than available storage during the AM. LOS E, v/c ratio greater than the critical threshold, and queue reach greater than available storage during the PM peak hour.
 - Southbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway
 - Eastbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Westbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
- ▶ Thorold Townline Road and Beaverdams Road:
 - All approaches with LOS F and v/c ratios greater than critical threshold during the PM peak hour.

Appendix F3 contains the detailed Synchro reports.



TABLE 4.3: 2040 BACKGROUND OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	A 7 0.25 23 90 67	B 15 0.79 104 - -	A 7 0.26 67 20 -47	B 13 - - -	A 8 0.28 26 55 29	B 13 0.70 73 - -	> > > > >	B 12 - -	C 22 0.55 43 20 -23	C 21 0.56 46 - -	> > > > >	C 22 - -	B 18 0.18 25 20 -5	B 19 0.43 41 - -	> > > > >	B 19 - -	B 15
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	C 16 0.45 27 - -	> > > > >	C 16 - -	< < < < <	C 21 0.61 28 - -	> > > > >	C 21 - -	< < < < <	D 31 0.80 66 - -	> > > > >	D 31 - -	< < < < <	C 18 0.52 38 - -	> > > > >	C 18 - -	C 23
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				C 15 0.77 29					A 8 0.58 3								A 9 0.50 3
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	F 297 1.46 101 90 -11	F 102 1.15 222 - -	B 14 0.40 92 20 -72	F 99 - -	F 156 1.08 177 55 -122	F 231 1.45 668 - -	> > > > >	F 226 - -	E 75 0.96 83 20 -63	C 23 0.57 213 - -	> > > > >	D 44 - -	B 18 0.20 27 20 -7	C 27 0.70 71 - -	> > > > >	C 26 - -	F 123
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	F 102 1.08 88 - -	> > > > >	F 102 - -	< < < < <	F 116 1.13 88 - -	> > > > >	F 116 - -	< < < < <	F 119 1.14 91 - -	> > > > >	F 119 - -	< < < < <	F 206 1.36 397 - -	> > > > >	F 206 - -	F 140
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q Ex Avail.				F 361 1.19 535					F 294 1.15 476								B 11 0.53 3

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



4.3 Total Traffic Operations

The operational analysis of total traffic conditions (with development) followed the same methodology used for existing and background traffic conditions.

4.3.1 Year 2030

Table 4.4 summarizes the level of service conditions for the weekday AM and PM peak hours. No changes to the existing signal timings have been assumed. The following critical movements are noted:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road:
 - Eastbound left-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound through with LOS D and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound right-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Westbound through/right-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Northbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Southbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway
 - Eastbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Westbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Southbound approach with LOS C and v/c ratio at the critical
- ▶ Thorold Townline Road and Beaverdams Road:
 - Northbound approach with LOS E and v/c ratio greater than the critical threshold during the AM peak hour.
 - All approaches with LOS F and v/c ratios greater than critical threshold during the PM peak hour.

Appendix G1 contains the detailed Synchro reports.



The minor approach of Street A at Thorold Townline Road is forecast to operate with LOS E and v/c ratio of 0.70 during the PM peak hour. The low v/c ratio indicates that while there is delay, there remains excess capacity for this movement.

The remaining two proposed municipal roadway connections to Thorold Townline Road are forecast to operate at LOS C or better with v/c ratios of less than 0.40 during the AM and PM peak hours.



TABLE 4.4: 2030 TOTAL OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall	
				Eastbound				Westbound				Northbound				Southbound					
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	B 14 0.32 31 90 59	C 26 0.83 111 - -	B 12 0.24 61 20 -41	C 23	B 14 0.31 23 55 32	C 28 0.84 84 - -	> > > > >	C 27	B 17 0.38 40 20 -20	B 17 0.42 55 - -	> > > > >	B 17	D 45 0.84 78 20 -58	B 18 0.49 135 - -	> > > > >	C 29	C 24	
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	C 15 0.39 25 - -	> > > > >	C 15	< < < < <	C 20 0.58 27 - -	> > > > >	C 20	< < < < <	E 46 0.92 69 - -	> > > > >	E 46	< < < < <	C 18 0.50 34 - -	> > > > >	C 18	D 29	
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				B 13 0.71 16					A 7 0.52 3								B 11 0.62 3	B 10
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	B 14 0.31 21		> > >	B 14					< < <	A 2 0.05 15		A 2		A 0 0.14 1	> > >	A 0	A 4	
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 11 0.02 9		> > >	B 11					< < <	A 0 0.00 3		A 0		A 0 0.13 0	> > >	A 0	A 0	
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	B 14 0.32 23		> > >	B 14					< < <	A 1 0.03 12		A 1		A 0 0.17 1	> > >	A 0	A 4	
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	F 246 1.34 73 90 17	D 41 0.96 110 - -	B 12 0.32 76 20 -56	D 51	C 21 0.58 177 55 -122	F 243 1.48 620 - -	> > > > >	F 231	E 77 0.95 77 20 -57	C 30 0.74 297 - -	> > > > >	D 45	D 47 0.82 75 20 -55	C 34 0.80 162 - -	> > > > >	D 37	F 108	
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	F 56 0.90 48 - -	> > > > >	F 56	< < < < <	F 122 1.15 69 - -	> > > > >	F 122	< < < < <	F 158 1.25 129 - -	> > > > >	F 158	< < < < <	F 191 1.33 146 - -	> > > > >	F 191	F 139	
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				F 377 1.20 552					F 176 1.09 352								B 13 0.63 6	F 239
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	E 42 0.70 76		> > >	E 42					< < <	A 5 0.19 33		A 5		A 0 0.29 63	> > >	A 0	A 9	
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 13 0.02 8		> > >	B 13					< < <	A 0 0.01 8		A 0		A 0 0.29 129	> > >	A 0	A 0	
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	C 20 0.40 89		> > >	C 20					< < <	A 2 0.09 36		A 2		A 0 0.31 96	> > >	A 0	A 4	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



4.3.2 Year 2035

Table 4.5 summarizes the level of service conditions for the weekday AM and PM peak hours. No changes to the existing signal timings have been assumed. The following critical movements are noted:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road:
 - Eastbound left-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound through with LOS D and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound right-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Westbound through/right-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Northbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Southbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway
 - Eastbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Westbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
- ▶ Thorold Townline Road and Beaverdams Road:
 - Northbound approach with LOS F and v/c ratio greater than the critical threshold during the AM peak hour.
 - All approaches with LOS F and v/c ratios greater than critical threshold during the PM peak hour.

Appendix G2 contains the detailed Synchro reports.

The minor approach of Street A at Thorold Townline Road is forecast to operate with LOS E and v/c ratio of 0.75 during the PM peak hour. The low v/c ratio indicates that while there is delay, there remains excess capacity for this movement.



The remaining two proposed municipal roadway connections to Thorold Townline Road are forecast to operate at LOS C or better with v/c ratios of less than 0.42 during the AM and PM peak hours.



TABLE 4.5: 2035 TOTAL OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	B 14 0.36 35 90 55	C 29 0.87 124 - -	B 13 0.26 71 20 -51	C 25	B 15 0.38 32 55 23	C 32 0.88 103 - -	> > > >	C 31	B 19 0.43 41 20 -21	B 19 0.47 46 - -	> > > >	B 19	E 59 0.89 80 20 -60	B 19 0.52 145 - -	> > > >	D 36	C 28
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	C 17 0.45 25 - -	> > > > >	C 17	< < < < <	C 24 0.65 28 - -	> > > > >	C 24	< < < < <	F 71 1.02 77 - -	> > > > >	F 71	< < < < <	C 20 0.57 35 - -	> > > > >	C 20	E 41
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				C 16 0.77 29				A 8 0.56 3								B 12 0.64 6	B 12
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	B 14 0.31 21		> > >	B 14					< < <	A 2 0.05 14		A 2		A 0 0.14 0	> > >	A 0	A 4
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 11 0.02 10		> > >	B 11					< < <	A 0 0.00 2		A 0		A 0 0.14 0	> > >	A 0	A 0
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	B 14 0.33 23		> > >	B 14					< < <	A 1 0.03 12		A 1		A 0 0.18 1	> > >	A 0	A 4
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	F 301 1.47 86 90 4	E 76 1.08 131 - -	B 14 0.36 82 20 -62	F 81	F 121 0.97 172 55 -117	F 309 1.62 582 - -	> > > >	F 299	F 87 0.98 86 20 -66	C 29 0.74 517 - -	> > > >	D 48	D 41 0.78 83 20 -63	C 33 0.80 192 - -	> > > >	C 35	F 141
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	F 75 0.99 77 - -	> > > > >	F 75	< < < < <	F 156 1.24 116 - -	> > > > >	F 156	< < < < <	F 194 1.33 145 - -	> > > > >	F 194	< < < < <	F 245 1.46 485 - -	> > > > >	F 245	F 176
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				F 569 1.28 609				F 309 1.16 460								B 14 0.66 10	F 379
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	E 50 0.75 61		> > >	E 50					< < <	A 5 0.20 13		A 5		A 0 0.31 54	> > >	A 0	B 10
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 14 0.02 8		> > >	B 14					< < <	A 0 0.01 5		A 0		A 0 0.31 17	> > >	A 0	A 0
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	C 21 0.42 11		> > >	C 21					< < <	A 2 0.09 2		A 2		A 0 0.33 0	> > >	A 0	A 4

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



4.3.3 Year 2040

Table 4.6 summarizes the level of service conditions for the weekday AM and PM peak hours. No changes to the existing signal timings have been assumed. The following critical movements are noted:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road:
 - Eastbound left-turn with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Eastbound through with LOS D and v/c ratio greater than the critical threshold during the AM and PM peak hour.
 - Eastbound right-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Westbound through/right-turn with LOS D and v/c ratio greater than critical threshold during the AM peak hour. LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Northbound left-turn with a queue reach greater than available storage during the AM and PM peak hours.
 - Southbound left-turn with LOS E, v/c ratio greater than the critical threshold, and a queue reach greater than available storage during the AM peak hour. Queue reach greater than the available storage during the PM peak hour.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway
 - Eastbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
 - Westbound approach with LOS F and v/c ratio greater than the critical threshold during the PM peak hour.
- ▶ Thorold Townline Road and Beaverdams Road:
 - Northbound approach with LOS F and v/c ratio greater than the critical threshold during the AM peak hour.
 - All approaches with LOS F and v/c ratios greater than critical threshold during the PM peak hour.

Appendix G3 contains the detailed Synchro reports.

The minor approach of Street A at Thorold Townline Road is forecast to operate with LOS F and v/c ratio of 0.81 during the PM peak hour. The low v/c ratio indicates that while there is delay, there remains excess capacity for this movement.



The two remaining proposed municipal roadway connections to Thorold Townline Road are forecast to operate at LOS C or better and with v/c ratios of 0.44 or lower during the AM and PM peak hours.



TABLE 4.6: 2040 TOTAL OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																	
				Eastbound				Westbound				Northbound				Southbound				Overall	
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach		
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	B 16 0.42 45 90 45	D 35 0.91 133 - -	B 13 0.29 84 20 -64	C 30	B 18 0.47 46 55 9	D 40 0.92 115 - -	> > > > >	D 38	C 21 0.49 46 20 -26	C 20 > > 58 - -	> > > > >	C 20	E 75 0.95 86 20 -66	C 21 0.55 193 - -	> > > > >	D 43	C 33	
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	C 19 19 0.50 29 -	> > > > >	C 19	< < < < <	D 28 28 0.72 33 -	> > > > >	D 28	< < < < <	F 102 102 1.12 99 -	> > > > >	F 102	< < < < <	C 23 23 0.63 41 -	> > > > >	C 23	F 55	
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				C 21 0.83 52					A 8 0.60 3								B 14 0.67 13	C 15
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	B 15 0.33 25		> > >	B 15					< < <	A 2 2 0.05 15		A 2		A 0 0 0.15 0	> > > >	A 0	A 4	
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 11 0.02 10		> > >	B 11					< < <	A 0 0 0.00 4		A 0		A 0 0 0.14 0	> > > >	A 0	A 0	
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	B 14 0.34 27		> > >	B 14					< < <	A 1 1 0.03 13		A 1		A 0 0 0.19 3	> > > >	A 0	A 4	
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	F 340 1.56 149 90 -59	F 91 1.12 324 - -	B 14 0.40 81 20 -61	F 94	F 156 1.08 174 55 -119	F 350 1.72 584 - -	> > > > >	F 339	F 155 1.19 87 20 -67	C 33 0.80 877 - -	> > > > >	E 74	E 57 0.87 88 20 -68	D 38 0.86 221 - -	> > > > >	D 43	F 164	
	Thorold Townline Road & Beaverdams Road	AWSC	LOS Delay V/C Q Ex Avail.	< < < < <	F 103 103 1.09 118 -	> > > > >	F 103	< < < < <	F 184 184 1.31 408 -	> > > > >	F 184	< < < < <	F 225 225 1.41 232 -	> > > > >	F 225	< < < < <	F 292 292 1.57 743 -	> > > > >	F 292	F 210	
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				F 799 1.36 609					F 476 1.23 618								C 16 0.68 16	F 551
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	F 60 0.81 234		> > >	F 60					< < <	A 5 5 0.20 35		A 5		A 0 0 0.33 119	> > >	A 0	B 11	
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 15 0.02 9		> > >	B 15					< < <	A 0 0 0.01 6		A 0		A 0 0 0.32 200	> > >	A 0	A 0	
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	C 23 0.44 164		> > >	C 23					< < <	A 2 2 0.09 27		A 2		A 0 0 0.35 145	> > >	A 0	A 4	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



5 Remedial Measures

5.1 Lundy's Lane and Thorold Townline Road

Intersection capacity deficiencies at the Lundy's Lane (Highway 20) and Thorold Townline Road intersection are forecast to occur with the anticipated background traffic growth. That is, without the development of the subject site.

The intersection is forecast to operate with delay and capacity constraints under future background traffic conditions. Specifically, the eastbound and westbound approaches during the PM peak hour.

Optimizing the signal timings splits within the existing cycle lengths will not completely mitigate the delay and capacity issues, specifically for the individual movements with high traffic volumes.

The addition of a second through lane for the eastbound and westbound directions will allow more east/west traffic through the intersection allowing more green time to the northbound and southbound approaches.

The addition of the second eastbound and westbound through lanes are required under the 2030 background horizon. It is recommended the Ministry of Transportation (MTO) / Region monitor traffic volumes for this intersection to determine when widening is required as a result of background traffic.

5.2 Lundy's Lane and Barker Parkway

Intersection capacity deficiencies at the Lundy's Lane (Highway 20) and Thorold Townline Road intersection are forecast to occur with the anticipated background traffic growth. That is, without the development of the subject site.

The intersection is forecast to operate with delay and capacity constraints under future background traffic conditions. Specifically, the eastbound and westbound approaches during the PM peak hour.

The widening of the roundabout to a two-lane roundabout would allow the addition of a second approach lane for the eastbound and westbound directions increasing the capacity of the roundabout.

The widening of the roundabout and eastbound and westbound approaches are required under the 2030 background horizon. It is recommended the Ministry of Transportation (MTO) / Region monitor



traffic volumes for this intersection to determine when widening is required as a result of background traffic.

5.3 Thorold Townline Road and Beaverdams Road

Intersection capacity deficiencies at the Thorold Townline Road and Beaverdams Road intersection are forecast to occur with the anticipated background traffic growth. That is, without the development of the subject site.

The intersection is forecast to operate with delay and capacity constraints for all approaches under future background traffic conditions.

The intersection was assessed using the *Ontario Traffic Manual*¹⁴ (Book 12 – Traffic Signals) Justification 7 signal warrant procedures. It indicates that traffic control signals are 120% warranted under 2030 future background conditions. **Appendix H** contains the warrant analysis.

Even with traffic control signals, the intersection is forecast to operate with delay and capacity constraints based on its current lane configuration. Exclusive left-turn lanes for all approaches would improve the operations at the intersections. Although exclusive left-turn lanes are not required for some approaches, the need for lane balancing would be required for safety purposes.

It should be noted that there is the potential for environmental constraints on the south side of Beaverdams Road that may limit the ability to expand the intersections lane geometry.

To accommodate the forecast growth in non-site related traffic, it is recommended that the Region install a warranted traffic control signal by the 2030 background horizon. In addition, auxiliary turn lanes on all approaches should be considered, provided the expanded lane geometry can be accommodated without impacting the environmental features on the south side of Beaverdams Road.

It is recommended that the Region monitor the future traffic volumes at this intersection and update the traffic control measures and lane geometry accordingly.

¹⁴ Ontario Ministry of Transportation, Ontario Traffic Manual Book 12: Traffic Signals, (Toronto: Queen's Printer for Ontario, 2012).



5.4 Thorold Townline Road and Street A

The new intersection of Thorold Townline Road and Street A is forecast to operate with acceptable levels of service during the AM peak hour and increased delay during the PM peak hour under future traffic conditions.

The forecast v/c ratio for the minor approach indicates that while there is delay, there remains excess capacity for this movement. The intersection was assessed using the *Ontario Traffic Manual*¹⁵ (Book 12 – Traffic Signals) Justification 7 signal warrant procedures. It indicates that traffic control signals are not warranted under 2040 future total conditions. **Appendix H** contains the warrant analysis.

The need for auxiliary turn lanes at this intersection was assessed.

5.4.1 Left-Turn Lane

The need for dedicated left-turn lane at Street A with Thorold Townline Road was assessed using Ministry of Transportation (MTO) procedures outlined in the *Design Supplement for the TAC Guide*¹⁶.

The percentages of left-turning vehicles in the approaching volume were rounded to the nearest 5%, as nomographs are only provided for 5% increments. This apparent requirement is due to the nature of the warrant procedure that assumes a minimum of 5% of left turning vehicles in the advancing volume.

A design speed of 20 km/h over the posted speed limit was used as the study area roads are rural with higher travel speeds than an urban setting.

The warrants have been completed for the AM and PM peak hour for all horizon years using the two-lane highways unsignalized nomographs.

Table 5.1 summarizes the left-turn lane warrant analyses. It indicates that a northbound left-turn lane with 40 metres of storage is warranted starting from the 2030 total horizon year. Ten additional metres of storage (50 metres total) is warranted in the 2040 horizon years.

¹⁵ Ontario Ministry of Transportation, *Ontario Traffic Manual Book 12: Traffic Signals*, (Toronto: Queen's Printer for Ontario, 2012).

¹⁶ Ontario Ministry of Transportation, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, (Toronto: Queen's Printer for Ontario, 2020),



**TABLE 5.1: STREET A LEFT-TURN LANE WARRANT SUMMARY
(100 KM/H DESIGN SPEED)**

Roadway	Thorold Townline Road					
Intersection	Street A					
Approach Direction	Northbound					
Design Speed	100 km/h					
Horizon	Total (2030)		Total (2035)		Total (2040)	
Peak Hour	AM	PM	AM	PM	AM	PM
Advancing Volume	327	470	346	490	366	511
Opposing Volumes	209	453	220	480	233	509
Left Turning Traffic	64	189	64	189	64	189
% of Left Turning Traffic	20%	40%	18%	39%	17%	37%
Figure Used*	9A-23	9A-25	9A-23	9A-25	9A-23	9A-25
Warranted	Yes	Yes	Yes	Yes	Yes	Yes
Storage Length Required	15m	40m	15m	40m	15m	50m

* Based on MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads - June 2017

Upon full build-out of the development, the Region of Niagara discussed the possibility of urbanizing Thorold Townline Road and with it, a lower speed limit. **Table 5.2** summarizes the left-turn lane warrant analysis using a 70 km/h design speed to reflect a reduced speed limit of 50 km/h within an urbanized area. A northbound left-turn lane with 30 metres of storage is warranted starting from the 2030 total horizon year. Ten additional metres of storage (40 metres total) is warranted in the 2040 horizon year.

**TABLE 5.2: STREET A LEFT-TURN LANE WARRANT SUMMARY
(70 KM/H DESIGN SPEED)**

Roadway	Thorold Townline Road					
Intersection	Street A					
Approach Direction	Northbound					
Design Speed	70 km/h					
Horizon	Total (2030)		Total (2035)		Total (2040)	
Peak Hour	AM	PM	AM	PM	AM	PM
Advancing Volume	327	470	346	490	366	511
Opposing Volumes	209	453	220	480	233	509
Left Turning Traffic	64	189	64	189	64	189
% of Left Turning Traffic	20%	40%	18%	39%	17%	37%
Figure Used*	9A-11	9A-13	9A-11	9A-13	9A-11	9A-13
Warranted	Yes	Yes	Yes	Yes	Yes	Yes
Storage Length Required	15m	30m	15m	30m	15m	40m

* Based on MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads - June 2017



Appendix I contains the left-turn warrant nomographs.

It is recommended that a northbound left-turn lane with 40 metres of storage be constructed on Thorold Townline Road when the Street A connection to Thorold Townline Road is established.

5.4.2 Right-Turn Lane

The proposed intersection of Thorold Townline Road and Street A was assessed to determine if the forecast traffic volumes warrant installation of auxiliary right-turn lanes.

Although right-turns are generally made more efficiently than left-turn movements, exclusive right-turn lanes are often provided for many of the same reasons that left-turn lanes are provided such as a reduction in rear-end collisions and less delay for the through traffic.

MTO guidelines (*Geometric Design Standards for Ontario Highways*) note that right-turn lanes or tapers may be considered where right-turn volumes exceed 60 vehicles per hour (vph) and where right-turning vehicles create a hazard or reduce capacity at the intersection.

The highest forecast right-turn movement at the proposed municipal roadway connection is approximately 30 vph during the AM peak hour and 70 vph during the PM peak hour. A right-turn lane could be considered.

It is recommended that a southbound right-turn taper be constructed on Thorold Townline Road when the Street A connection to Thorold Townline Road is established.

5.5 Thorold Townline Road and Street B

The new intersection of Thorold Townline Road and Street B is forecast to operate with acceptable levels of service during the AM and PM peak hour under future traffic conditions.

The need for auxiliary turn lanes at this intersection was assessed.

5.5.1 Left-Turn Lane

The need for dedicated left-turn lane at Street B with Thorold Townline Road was assessed using Ministry of Transportation (MTO) procedures outlined in the *Design Supplement for the TAC Guide*.

A design speed of 20 km/h over the posted speed limit was used. **Table 5.3** summarizes the left-turn lane warrant analyses. It indicates



that a northbound left-turn lane with 15 metres of storage is warranted starting from the 2030 total horizon year.

**TABLE 5.3: STREET B LEFT-TURN LANE WARRANT SUMMARY
(100 KM/H DESIGN SPEED)**

Roadway	Thorold Townline Road					
Intersection	Street B					
Approach Direction	Northbound					
Design Speed	100 km/h					
Horizon	Total (2030)		Total (2035)		Total (2040)	
Peak Hour	AM	PM	AM	PM	AM	PM
Advancing Volume	334	363	363	383	373	404
Opposing Volumes	202	452	213	479	226	508
Left Turning Traffic	3	9	3	9	3	9
% of Left Turning Traffic	1%	2%	1%	2%	1%	2%
Figure Used*	9A-22	9A-22	9A-22	9A-22	9A-22	9A-22
Warranted	No	Yes	No	Yes	No	Yes
Storage Length Required	-	15m	-	15m	-	15m

* Based on MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads - June 2017

Upon full build-out of the development, the Region of Niagara discussed the possibility of urbanizing Thorold Townline Road and with it, a lower speed limit. **Table 5.4** summarizes the left-turn lane warrant analysis using a 70 km/h design speed to reflect a reduced speed limit of 50 km/h within an urbanized area. A northbound left-turn lane is not warranted if Thorold Townline Road is urbanized with a lower speed limit.

**TABLE 5.4: STREET B LEFT-TURN LANE WARRANT SUMMARY
(70 KM/H DESIGN SPEED)**

Roadway	Thorold Townline Road					
Intersection	Street B					
Approach Direction	Northbound					
Design Speed	70 km/h					
Horizon	Total (2030)		Total (2035)		Total (2040)	
Peak Hour	AM	PM	AM	PM	AM	PM
Advancing Volume	334	363	363	383	373	404
Opposing Volumes	202	452	213	479	226	508
Left Turning Traffic	3	9	3	9	3	9
% of Left Turning Traffic	1%	2%	1%	2%	1%	2%
Figure Used*	9A-10	9A-10	9A-10	9A-10	9A-10	9A-10
Warranted	No	No	No	No	No	No
Storage Length Required	-	-	-	-	-	-

* Based on MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads - June 2017



Appendix I contains the left-turn warrant nomographs.

5.5.2 Right-Turn Lane

The proposed intersection of Thorold Townline Road and Street B was assessed to determine if the forecast traffic volumes warrant installation of auxiliary right-turn lanes.

The highest forecast right-turn movement at the proposed municipal roadway connection is approximately 1 vph during the AM peak hour and 5 vph during the PM peak hour. A right-turn lane would not be warranted. The southbound travel lane can operate as a shared through/right-turn lane.

5.6 Thorold Townline Road and Street C

The new intersection of Thorold Townline Road and Street C is forecast to operate with acceptable levels of service during the AM and PM peak hour under future traffic conditions.

The need for auxiliary turn lanes at this intersection was assessed.

5.6.1 Left-Turn Lane

The need for dedicated left-turn lane at Street C with Thorold Townline Road was assessed using Ministry of Transportation (MTO) procedures outlined in the *Design Supplement for the TAC Guide*¹⁷.

A design speed of 20 km/h over the posted speed limit was used.

Table 5.5 summarizes the left-turn lane warrant analyses. It indicates that a northbound left-turn lane with 30 metres of storage is warranted starting from the 2030 total horizon year.

¹⁷ Ontario Ministry of Transportation, *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, (Toronto: Queen's Printer for Ontario, 2020),



**TABLE 5.5: STREET C LEFT-TURN LANE WARRANT SUMMARY
(100 KM/H DESIGN SPEED)**

Roadway	Thorold Townline Road					
Intersection	Street C					
Approach Direction	Northbound					
Design Speed	100 km/h					
Horizon	Total (2030)		Total (2035)		Total (2040)	
Peak Hour	AM	PM	AM	PM	AM	PM
Advancing Volume	313	515	332	535	352	556
Opposing Volumes	270	487	281	514	294	543
Left Turning Traffic	34	83	34	83	34	83
% of Left Turning Traffic	11%	16%	10%	16%	10%	15%
Figure Used*	9A-22	9A-23	9A-22	9A-23	9A-22	9A-23
Warranted	Yes	Yes	Yes	Yes	Yes	Yes
Storage Length Required	15m	30m	15m	30m	15m	30m

* Based on MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads - June 2017

Upon full build-out of the development, the Region of Niagara discussed the possibility of urbanizing Thorold Townline Road and with it, a lower speed limit. **Table 5.6** summarizes the left-turn lane warrant analysis using a 70 km/h design speed to reflect a reduced speed limit of 50 km/h within an urbanized area. A northbound left-turn lane with 25 metres is warranted starting from the 2030 horizon year. Five additional metres of storage (30 metres total) is warranted in the 2040 horizon year.

**TABLE 5.6: STREET C LEFT-TURN LANE WARRANT SUMMARY
(70 KM/H DESIGN SPEED)**

Roadway	Thorold Townline Road					
Intersection	Street C					
Approach Direction	Northbound					
Design Speed	70 km/h					
Horizon	Total (2030)		Total (2035)		Total (2040)	
Peak Hour	AM	PM	AM	PM	AM	PM
Advancing Volume	313	515	332	535	352	556
Opposing Volumes	270	487	281	514	294	543
Left Turning Traffic	34	83	34	83	34	83
% of Left Turning Traffic	11%	16%	10%	16%	10%	15%
Figure Used*	9A-10	9A-11	9A-10	9A-11	9A-10	9A-11
Warranted	No	Yes	No	Yes	No	Yes
Storage Length Required	-	25m	-	25m	-	30m

* Based on MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads - June 2017

Appendix I contains the left-turn warrant nomographs.



It is recommended that a northbound left-turn lane with 30 metres of storage be constructed on Thorold Townline Road when the Street C connection to Thorold Townline Road is established.

5.6.2 Right-Turn Lane

The proposed intersection of Thorold Townline Road and Street B was assessed to determine if the forecast traffic volumes warrant installation of auxiliary right-turn lanes.

The highest forecast right-turn movement at the proposed municipal roadway connection is approximately 25 vph during the AM peak hour and 100 vph during the PM peak hour. A right-turn lane could be considered.

It is recommended that a southbound right-turn taper be constructed on Thorold Townline Road when the Street C connection to Thorold Townline Road is established.

5.6.3 Queue Reach

The northbound left-turn queue reach on Thorold Townline Road at Street C is forecast to be approximately 15 metres (PM peak hour). The southbound queue reach on Thorold Townline Road at Lundy's Lane (Highway 20) is forecast at 82 metres (PM peak hour).

With approximately 155 metres separation between Lundy's Lane (Highway 20) and Street C, there should be adequate distance for back-to-back left-turn lanes to be constructed on Thorold Townline.

5.7 Operational Analysis with Improvements

Synchro analysis was conducted for the 2030 horizon year full build-out total traffic conditions with no adjustments to traffic volumes and the following improvements:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road:
 - Second eastbound through lane;
 - Second westbound through lane; and
 - Optimized signal timings.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway:
 - Two-lane roundabout;
- ▶ Thorold Townline Road and Beaverdams Road:
 - Traffic control signals with optimized signal timings;



- Eastbound left-turn lane with 20 metres of storage;
- Westbound left-turn lane with 25 metres of storage;
- Northbound left-turn lane with 40 metres of storage; and
- Southbound left-turn lane with 20 metres of storage.
- ▶ Thorold Townline Road and Street A:
 - Northbound left-turn lane with 40 metres of storage; and
 - Southbound right-turn taper.
- ▶ Thorold Townline Road and Street C:
 - Northbound left-turn lane with 30 metres of storage; and
 - Southbound right-turn taper.

Table 5.7 summarizes the level of service conditions for the year 2030 total traffic conditions with the remedial measures outlined above. With the implementation of the noted remedial measures, intersection operations are forecast to operate with acceptable level of service.

Appendix J contains the detailed Synchro and Arcady reports.



TABLE 5.7: 2030 TOTAL OPERATIONS WITH IMPROVEMENTS

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	B 13 0.20 26 90 64	B 14 0.50 49 - -7	B 12 0.21 27 20 -7	B 14 14	B 13 0.23 19 55 36	B 14 0.50 40 - -	> > > >	B 14 14	B 12 0.33 36 20 -16	B 12 0.39 40 - -	> > > >	B 12 12	C 25 0.73 74 20 -54	B 12 0.45 58 - -	> > > >	B 18 18	B 14 14
	Thorold Townline Road & Beaverdams Road	TCS	LOS Delay V/C Q Ex Avail.	B 15 0.21 17 50 34	B 17 0.44 27 - -	> > > > >	B 16 16	B 19 0.54 22 50 28	B 20 0.61 25 - -	> > > > >	B 19 19	A 5 0.08 13 50 37	B 11 0.67 62 - -	> > > > >	B 10 10	A 5 0.06 14 50 36	A 7 0.36 36 - -	> > > > >	A 7 7	B 12 12
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				A 3 0.38 3				A 3 0.28 3								A 3 0.32 3	A 3 3
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	B 14 0.30 20		> > >	B 14 14					A 8 0.05 11	A 0 0.17 0		A 2 2		A 0 0.11 0	A 0 0.02 0	A 0 0	A 4 4
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 11 0.02 10		> > >	B 11 11					A 8 0.00 2	A 0 0.21 0		A 0 0		A 0 0.13 0	A > > >	A 0 0	A 0 0
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	B 13 0.32 20		> > >	B 13 13					A 8 0.03 9	A 0 0.18 0		A 1 1		A 0 0.16 0	A 0 0.01 0	A 0 0	A 4 4
PM Peak Hour	Highway 20 (Lundy's Lane) & Thorold Townline Road	TCS	LOS Delay V/C Q Ex Avail.	C 30 0.69 41 90 49	B 14 0.54 59 - -17	B 12 0.28 37 20 -17	B 15 15	B 12 0.30 21 55 34	C 21 0.83 78 - -	> > > >	C 21 21	D 42 0.82 61 20 -41	C 23 0.69 78 - -	> > > >	C 29 29	C 29 0.71 54 20 -34	C 26 0.74 82 - -	> > > >	C 27 27	C 21 21
	Thorold Townline Road & Beaverdams Road	TCS	LOS Delay V/C Q Ex Avail.	B 13 0.14 19 50 31	B 16 0.56 46 - -	> > > > >	B 16 16	C 23 0.69 45 50 5	B 15 0.45 35 - -	> > > > >	B 18 18	B 11 0.21 27 50 23	B 18 0.71 75 - -	> > > >	B 17 17	B 10 0.15 17 50 33	C 21 0.79 69 - -	> > > >	C 20 20	B 18 18
	Highway 20 (Lundy's Lane) & Baker Parkway	RBT	LOS Delay V/C Q				A 5 0.65 6				A 5 0.59 3								A 3 0.31 3	A 5 5
	Thorold Townline Road & Street A	TWSC	LOS Delay V/C Q	E 38 0.67 39		> > >	E 38 38					A 9 0.19 22	A 0 0.18 0		A 4 4		A 0 0.25 0	A 0 0.04 3	A 0 0	A 8 8
	Thorold Townline Road & Street B	TWSC	LOS Delay V/C Q	B 13 0.02 8		> > >	B 13 13					A 8 0.01 5	A 0 0.23 0		A 0 0		A 0 0.29 0	A > > >	A 0 0	A 0 0
	Thorold Townline Road & Street C	TWSC	LOS Delay V/C Q	C 18 0.37 21		> > >	C 18 18					A 9 0.09 15	A 0 0.28 0		A 1 1		A 0 0.25 0	A 0 0.06 3	A 0 0	A 3 3

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length (m)

Ex. - Existing Available Storage (m)

Avail. - Available Storage (m)

TCS - Traffic Control Signal

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

RBT - Roundabout



5.8 Summary

Delay and capacity deficiencies are forecast to occur at the study area intersections in the future with the anticipated background growth in traffic. With the addition of the site generated traffic, it is expected to exacerbate the delay and capacity deficiencies. Remedial measures to address the study area intersection operations include:

- ▶ Lundy's Lane (Highway 20) and Thorold Townline Road:
 - Existing eastbound left-turn lane with current storage (90 metres);
 - Second eastbound through lane;
 - Existing right-turn lane with 40 metres of storage (an increase of 20 metres);
 - Existing westbound left-turn lane with current storage (55 metres);
 - Second westbound through lane;
 - Existing northbound left-turn lane with 65 metres of storage (an increase of 45 metres);
 - Existing southbound left-turn lane with 75 metres of storage (an increase of 55 metres); and
 - Optimized signal timings.
- ▶ Lundy's Lane (Highway 20) and Barker Parkway:
 - Two-lane roundabout;
 - Second eastbound approach lane; and
 - Second westbound approach lane.
- ▶ Thorold Townline Road and Beaverdams Road:
 - Traffic control signals with optimized signal timings;
 - Eastbound left-turn lane with 20 metres of storage;
 - Westbound left-turn lane with 25 metres of storage;
 - Northbound left-turn lane with 40 metres of storage; and
 - Southbound left-turn lane with 20 metres of storage.
- ▶ Thorold Townline Road and Street A:
 - Northbound left-turn lane with 40 metres of storage; and
 - Southbound right-turn taper.

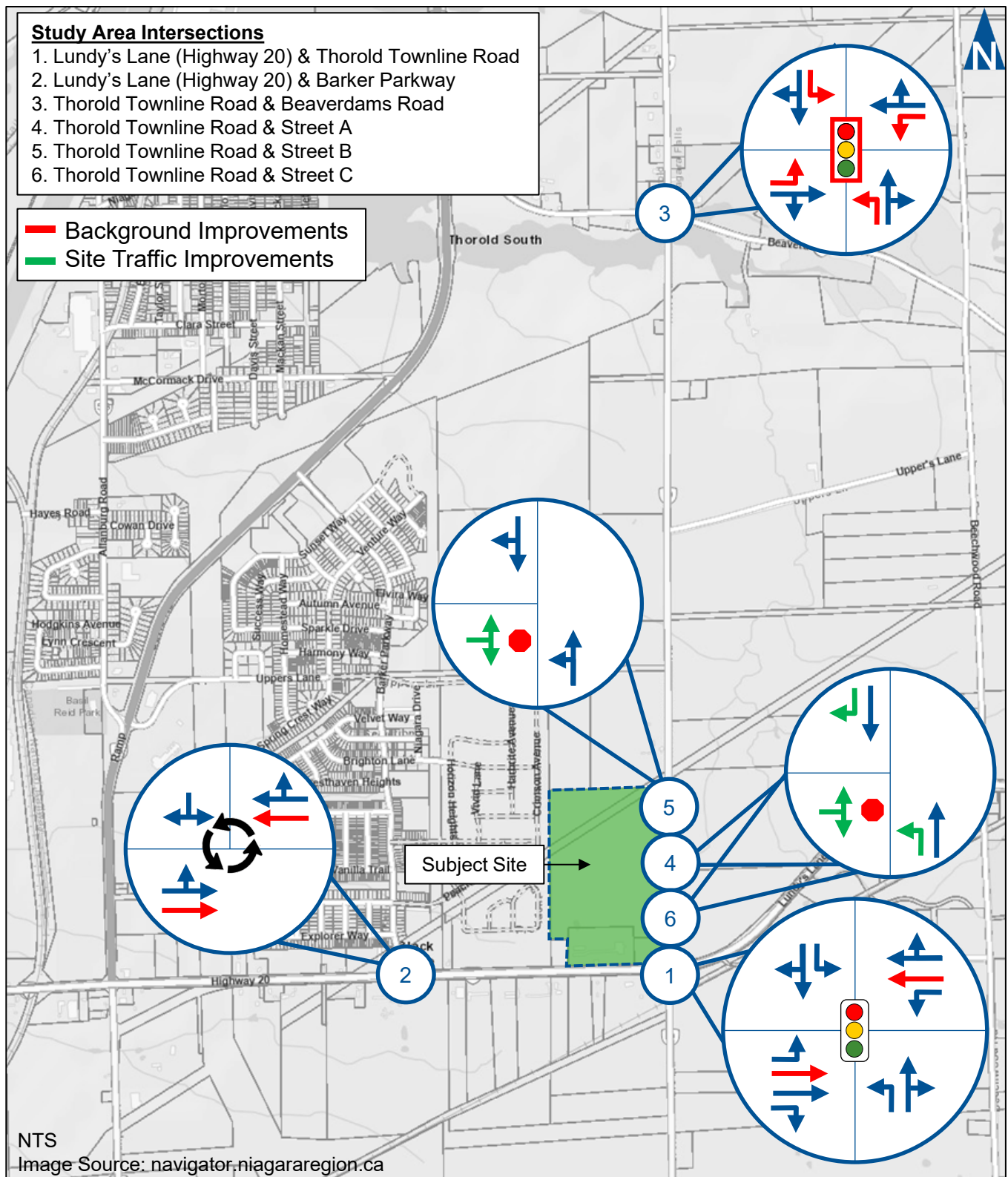


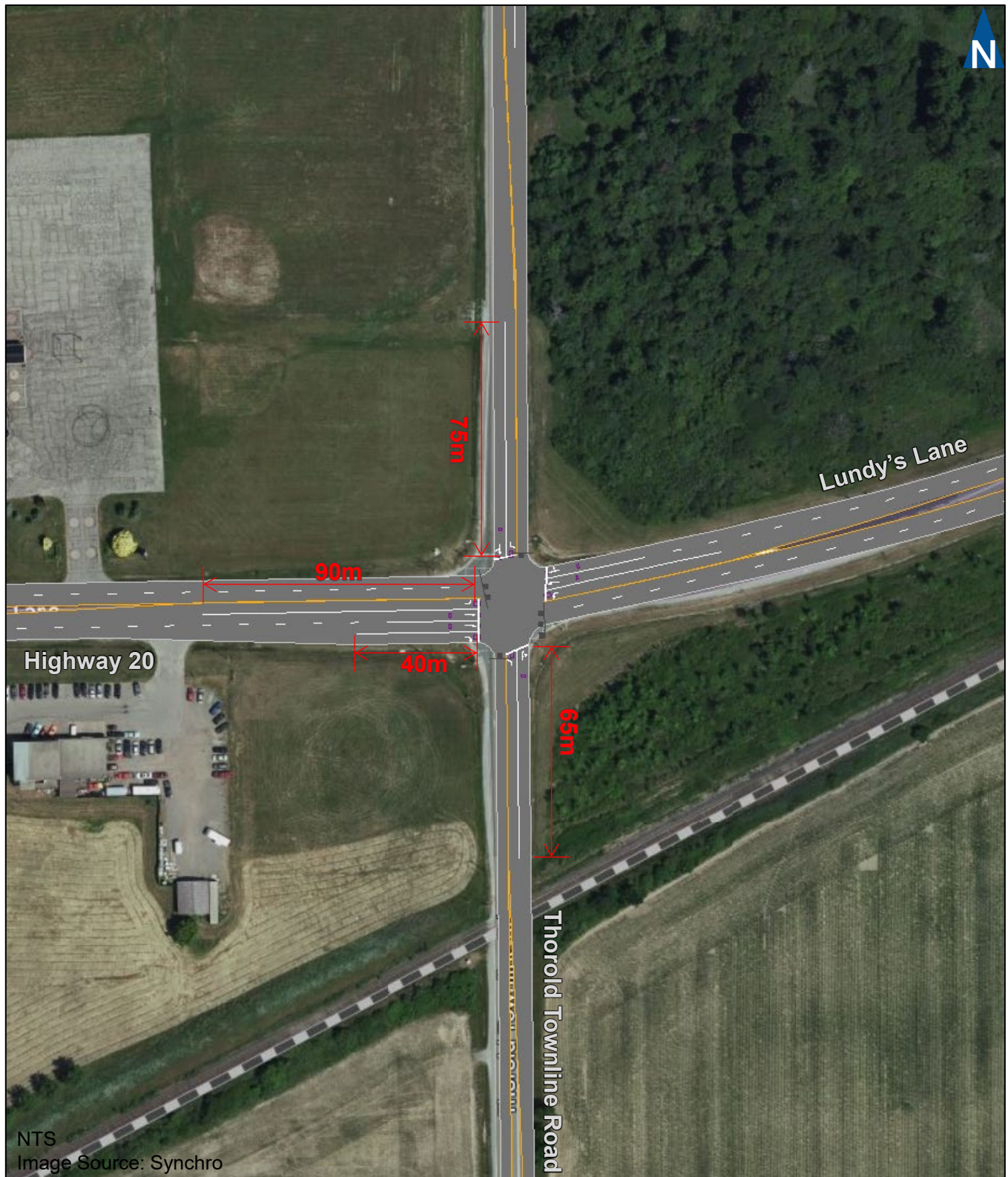
- ▶ Thorold Townline Road and Street C:
 - Northbound left-turn lane with 30 metres of storage; and
 - Southbound right-turn taper.

Figure 5.1 illustrates the future lane configuration and traffic control of the study area intersections.

Figure 5.2 through **Figure 5.6** illustrates the functional designs at the study area intersections with the road improvements listed above.









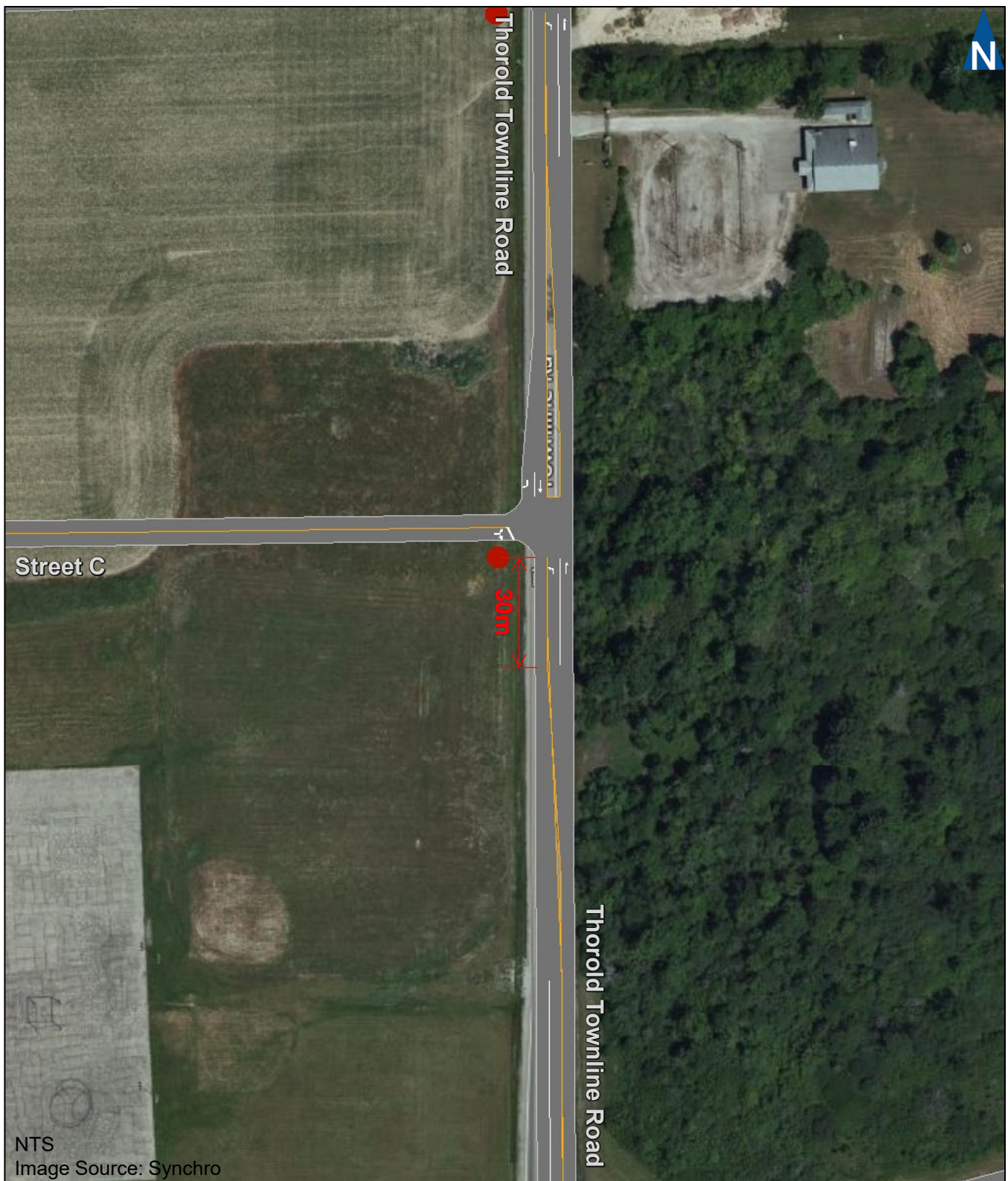




Thorold Townline Road & Street A

13030 Lundy's Lane, Thorold
210565

Figure 5.5



Thorold Townline Road & Street C

13030 Lundy's Lane, Thorold
210565

Figure 5.6

6 Conclusions & Recommendations

6.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** The study area intersections are currently operating with acceptable levels of service and within capacity.
- ▶ **Development Trip Generation:** The overall development at full build-out is forecast to generate 817 new trips in the AM peak hour and 1,043 new trips in the PM peak hour.
- ▶ **Background Traffic Forecast:** The future traffic volumes are estimated to consist of:
 - Generalized background traffic growth – estimated to be 2% per annum;
 - Traffic generated by the future development of:
 - The Rolling Meadows Development – a multi-phase development located west of the subject site, consisting of primarily residential units including single-family, townhomes, medium density, and high-density units; and
 - The proposed Upper's Quarry – a quarry located on the west side of Thorold Townline Road near Beechwood Road. The preferred haul route for the quarry will direct trucks northbound on Thorold Townline Road through non-residential areas.
- ▶ **Background Traffic Operations:** As the traffic volumes increase at the study area intersections, capacity issues are exacerbated, and additional issues are identified. Capacity issues are identified at the following intersections:
 - Lundy's Lane (Highway 20) and Thorold Townline Road from year 2030
 - Lundy's Lane (Highway 20) and Barker Parkway from year 2030; and
 - Thorold Townline Road and Beaverdams Road from year 2030.
- ▶ **Total Traffic Operations:** The capacity deficiencies identified under background conditions will continue to occur with the addition of site generated traffic. Site generated traffic results in capacity deficiencies at the following intersections:



- Lundy's Lane (Highway 20) and Thorold Townline Road from year 2030
- Lundy's Lane (Highway 20) and Barker Parkway from year 2030; and
- Thorold Townline Road and Beaverdams Road from year 2030.

Thorold Townline Road and Street A is forecast to operate with the minor approach at LOS E/F range and v/c ratios of 0.81 or less during the PM peak hour under total traffic conditions. Traffic control signals are not warranted under 2040 total traffic conditions.

The two remaining proposed municipal roadway connections to Thorold Townline Road are forecast to operate at LOS C or better with v/c ratios of less than 0.45 during the AM and PM peak hours.

- ▶ **Remedial Measures:** The intersection of Thorold Townline Road and Beaverdams Road is warranted for traffic control signals during 2030 background traffic conditions. In addition, auxiliary turn lanes on all approaches should be considered, provided the expanded lane geometry can be accommodated without impacting the environmental features on the south side of Beaverdams Road. This is warranted regardless of whether the subject development is built.

A northbound left-turn lane with 40 metres of storage is warranted on Thorold Townline Road at Street A from the 2030 total horizon.

A southbound right-turn taper on Thorold Townline Road at Street A is warranted from the 2030 total horizon.

A northbound left-turn lane with 15 metres of storage is warranted on Thorold Townline Road at Street B from the 2030 total horizon. However, if the speed limit on Thorold Townline Road is reduced, a northbound left-turn lane would not be warranted.

A northbound left-turn lane with 30 metres of storage is warranted on Thorold Townline Road at Street C from the 2030 total horizon.

A southbound right-turn taper on Thorold Townline Road at Street C is warranted from the 2030 total horizon.



6.2 Recommendations

Based on the findings of this study, it is recommended that:

- ▶ The MTO/Region monitors the future traffic volumes at the study area intersections and implement the following recommended improvements when necessary:
 - Lundy's Lane (Highway 20) at Thorold Townline Road – second eastbound and westbound through lanes starting from the 2030 background horizon;
 - Lundy's Lane (Highway 20) at Barker Parkway – widening of the roundabout and the eastbound and westbound approaches to two lanes starting from the 2030 background horizon; and
 - Thorold Townline Road at Beaverdams Road – installation of warranted traffic control signals and auxiliary left-turn lanes (if possible) starting from the 2030 background horizon.
- ▶ A northbound left-turn lane with 40 metres of storage and a southbound right-turn taper be constructed on Thorold Townline Road when the Street A connection is established.
- ▶ A northbound left-turn lane with 30 metres of storage and a southbound right-turn taper be constructed on Thorold Townline Road when the Street C connection is established.



Appendix A

Pre-Study Consultation



From: [Dunsmore, Susan](#)
To: [Andrew Evans](#); [Lagakos, Ted \(MTO\)](#)
Cc: [tphorn75@gmail.com](#); [Scott Catton](#); [Nunes, Paul \(MTO\)](#); [sean.dunsmore@thorold.ca](#); [Deluca, Peter \(MTO\)](#); [Angela Nesbitt](#)
Subject: RE: (210565) Thorold Townline Rd at Lundy's Lane (Hwy 20), Thorold TIS Scope of Work
Date: July 18, 2023 2:19:48 PM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)
[image006.png](#)
[image007.png](#)
[image008.png](#)
[PW5.R01.pdf](#)

Hello Andrew

Transportation planning staff have reviewed the TIS terms of reference and have provided the following comments in red below. For Regional traffic data requests can be made through the website using the following link: <https://www.niagararegion.ca/living/roads/permits/traffic-data-requests.aspx>. For any upgrades required on Thorold Townline Road functional designs are to be included in the TIS as per our guidelines.

If you require anything further please contact me at your convenience.

Thank you



Susan M. Dunsmore, P.Eng.
MANAGER, DEVELOPMENT ENGINEERING
Niagara Region, 1815 Sir Isaac Brock Way, Thorold, ON, L2V 4T7
P : (905) 980 - 6000 ext. 3661
W : www.niagararegion.ca
E : susan.dunsmore@niagararegion.ca



From: Andrew Evans <aevans@ptsl.com>
Sent: Thursday, June 29, 2023 8:18 AM
To: Lagakos, Ted (MTO) <Ted.Lagakos@ontario.ca>
Cc: tphorn75@gmail.com; Scott Catton <scatton@ptsl.com>; Dunsmore, Susan <Susan.Dunsmore@niagararegion.ca>; Nunes, Paul (MTO) <Paul.Nunes@ontario.ca>; sean.dunsmore@thorold.ca; Deluca, Peter (MTO) <Peter.Deluca@ontario.ca>; Angela Nesbitt <Angela.Nesbitt@thorold.ca>
Subject: RE: (210565) Thorold Townline Rd at Lundy's Lane (Hwy 20), Thorold TIS Scope of Work

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email system. Use caution when clicking links or opening attachments unless you recognize the sender and know the content is safe.

Greetings,

Based on previous discussions with MTO, please find below our revised terms of reference for a Transportation Impact Study for the proposed development of the lands on the northwest quadrant of Thorold Townline Road and Lundy's Lane (Highway 20) in the City of Thorold.

Please review and provide comment at your earliest convenience.

SITE DESCRIPTION

- The subject site is located on the northwest quadrant of Thorold Townline Road and Lundy's Lane (Highway 20) in the City of Thorold. The concept plan is primarily residential with a mixed-use/commercial block at the corner of Townline Road and Lundy's Lane. **The concept plan is attached.** The site statistics include the following land uses:

- Single family homes;
- Townhouses (several types),
- Mid-rise multifamily buildings, and
- Mixed-Use Residential/Commercial Land Uses.

Build out may occur in phases with the ultimate build-out date to be determined.

Vehicle access is proposed by three new municipal roadway connections to the Thorold Townline Road.

PROPOSED TERMS OF REFERENCE

- Study Area Intersections:

- Highway 20 & Thorold Townline Road (signalized)
- Thorold Townline Road & Beaverdams Road (unsignalized); and
- The proposed three new roadway connections to the existing road network.
- **Highway 20 and Barker Pkwy – Roundabout**

Analysis Periods:

- Weekday AM peak hour
- Weekday PM peak hour

Existing Data:

- Existing 8-hour TMC data for the above noted intersections being counted either July 6th or the week of July 10th.
- Existing signal timing plans.

Horizon Year

- **Existing condition**
- Build-out Year

- Five-years post build-out; and
- Ten-years post build-out.

If the development will be built in multiple phases, the study should include capacity analysis at the end of each phase, additional to the ultimate buildout year and the 5 & 10 years after buildout.

Analysis

- Synchro 11, HCM 2000 analysis
- SimTraffic Queueing (five 60-min iterations)

Background Traffic

- Generalized growth rate 2% per annum
- Active Development Applications. **To be identified by Region/City (City of Thorold and City of NF are to supply information on surrounding applications in the area)**
-

Future Road Improvements

- **To be identified by Region/City**
- **There are no Regional capital projects at this time in the area.**
-

Trip Generation

- ITE Trip Generation Data 11th Edition with no modal split reductions.
- ITE Pass-by Trip Rates (Commercial land uses)

Site Traffic Distribution

- TTS data- **Please also consider the existing traffic distribution**

Report

- We will document the study methodologies, findings, and conclusions in a report with appendices containing the detailed analysis results and any data collected.

Please let us know your comments on the study.

General Comments:

- Transportation staff have reviewed the TIS terms of reference and plan submitted and will permit one full access to Thorold Townline and the other two accesses would have to be restricted (if the TIS justify the need for additional restricted accesses). Three full access points are not supported by staff. The TIS will have to evaluate the required access requirements for the site and justify any additional full accesses beyond the one permitted
-
- Please include the left lane warrant analysis in the TIS.
- The Region might request a right-turn taper at the middle access if the number of generated trips is significant

- Additionally, Transportation team highly recommends the developer to urbanize this road segment of Thorold Townline Road (RR70) along the two development blocks, and the Region's Speed Limit Policy be used to determine if a change in the posted speed is warranted.
- If the Consultant utilizes historical traffic counts, traffic counts to be factored into a baseline condition (existing condition) using a growth rate of 2% per annum. Historic counts at Covid pandemic period to be avoided.
- The submitted site plan to show the following:
 1. Accesses dimensions and clear throat lengths. Clear throat length to be as per TAC requirements or TIS queue assessment results.
 2. The distance between the proposed accesses.
 3. All adjacent/ opposite existing driveway accesses at Thorold Townline Rd.
- The TIS/site plan to demonstrate the path of vehicles passing by the commercial blocks (Block 72 and Block 73). Will parking lots be allocated opposite to Thorold Townline road or behind the commercial buildings? Commercial buildings are to be accessed from Streets A & C.
-
- The Consultant is to follow Niagara Region Guidelines for TIS (2012) for traffic analysis software settings, intersections capacity thresholds and other requirements.
- For the ideal saturation flows, there are currently new saturation flow rates that will be a part of the new TIS Guidelines. The Consultant can use either the below new saturation values or 1750 across the board for all movements.

Variable	Ideal Saturation Flow
T	1,629
L	1,504
LT	1,228
LL	2,194
R	1,351
RT	1,388
LTR	1,483

Please let us know your comments on the study.

Thank you and regards.

Andrew Evans, M.Sc.

Transportation Planner

Paradigm Transportation Solutions Limited

p: 905.381.2229 x 305

m: 519.497.3239



From: Lagakos, Ted (MTO) <Ted.Lagakos@ontario.ca>

Sent: Tuesday, December 7, 2021 12:47 PM

To: Andrew Evans <aevans@ptsl.com>

Cc: tphorn75@gmail.com; Scott Catton <scatton@ptsl.com>; Dunsmore, Susan <Susan.Dunsmore@niagararegion.ca>; Nunes, Paul (MTO) <Paul.Nunes@ontario.ca>; sean.dunsmore@thorold.ca; Deluca, Peter (MTO) <Peter.Deluca@ontario.ca>; Angela Nesbitt <Angela.Nesbitt@thorold.ca>

Subject: RE: (210565) Thorold Townline Rd at Lundy's Lane (Hwy 20), Thorold TIS Scope of Work

Afternoon Andrew,

This is confirm that I will be the Ministry contact for this file. Please ensure that all future correspondence for MTO is sent directly to my attention.

The ministry has already provided the City pre-consultation comments where we stated that Highway 20 access will not be permitted, as well as intersection spacing requirements off of Thorold Town line Road.

As a result, please revise your scoping document and plan accordingly and resubmit for MTO review/comment.

Ted Lagakos
Senior Project Manager (Niagara/Hamilton)
Highway Corridor Management Section - Central Operations

Ministry of Transportation
159 Sir William Hearst Avenue, 7th Floor
Toronto, ON M3M 0B7

Phone: 416-268-3932

E-Mail: ted.lagakos@ontario.ca

Web: www.mto.gov.on.ca/english/engineering/management/corridor

From: Andrew Evans <aevans@ptsl.com>

Sent: December 7, 2021 11:40 AM

To: Dunsmore, Susan <Susan.Dunsmore@niagararegion.ca>; sean.dunsmore@thorold.ca; Nunes, Paul (MTO) <Paul.Nunes@ontario.ca>; Lagakos, Ted (MTO) <Ted.Lagakos@ontario.ca>

Cc: tphorn75@gmail.com; Scott Catton <scatton@ptsl.com>

Subject: (210565) Thorold Townline Rd at Lundy's Lane (Hwy 20), Thorold TIS Scope of Work

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Greetings,

Paradigm Transportation Solutions Limited is preparing the Transportation Impact Study for the proposed development of the lands on the northwest quadrant of Thorold Townline Road and Lundy's Lane (Highway 20) in the City of Thorold. Below is a brief description of the concept and our proposed terms of reference for the TIS.

Please review and provide comment at your earliest convenience.

SITE DESCRIPTION

-
The subject site is located on the northwest quadrant of Thorold Townline Road and Lundy's Lane (Highway 20) in the City of Thorold. The concept plan is primarily residential with a mixed-use/commercial block at the concern of Townline Road and Lundy's Lane. **The concept plan is attached.** The site statistics include the following land uses:

- Single family homes;
- Townhouses (several types),
- Mid-rise multifamily buildings, and
- Mixed-Use Residential/Commercial Land Uses.

Build out may occur in phases with the ultimate build-out date to be determined.

Vehicle access is proposed by three new municipal roadway connections to the external road network. The position of the proposed intersections are described generally as follows:

- Street A located approximately 390 metres north of Lundy's Lane on Thorold Townline Road.
- Street B located approximately 590 metres north of Lundy's Lane on Thorold Townline Road.
- Street C located approximately 300 metres west of Thorold Townline Road on Lundy's Lane (Highway 20).

PROPOSED TERMS OF REFERENCE

-
Study Area Intersections:

- Highway 20 & Highway 58 (signalized);
- Highway 20 & Thorold Townline Road (signalized);

- Thorold Townline Road & Beaverdams Road (unsignalized);
- The proposed new roadway connections to the existing road network.

Analysis Periods:

- Weekday AM peak hour
- Weekday PM peak hour

Existing Data:

- Existing 8-hour TMC data for the above noted intersections
- Existing signal timing plans.
- Should we collect new count data or should we rely on the historical count data and factor the old count data to a baseline condition?
- If counts will be factored to baseline condition we proposed a 2% growth rate per annum consistent with the Region's TIS guidelines.

Horizon Year

- Build-out Year
- Five-years post build-out; and
- Ten-years post build-out.

Analysis

- Synchro 10, HCM 2000 analysis
- SimTraffic Queueing (five 60-min iterations)

Background Traffic

- Generalized growth rate 2% per annum
- Active Development Applications. **To be identified by Region/City**

Future Road Improvements

- **To be identified by Region/City**

Trip Generation

- ITE Trip Generation Data 11th Edition with no modal split reductions.
- ITE Pass-by Trip Rates (Commercial land uses)

Site Traffic Distribution

- TTS data

Report

- We will document the study methodologies, findings, and conclusions in a report with appendices containing the detailed analysis results and any data collected.

Please let us know your comments on the study.

Thank you and regards.

Andrew Evans, M.Sc.

Transportation Planner



Paradigm Transportation Solutions Limited

5A-150 Pinebush Road Cambridge ON N1R 8J8

p: 905.381.2229 x 305

m: 519.497.3239

e: aevans@ptsl.com

w: www.ptsl.com

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Appendix B

Traffic Data



Hwy 20 @ Thorold Townline Rd

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 10:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Thorold

Site #: 0000000001

Intersection: Hwy 20 & Thorold Townline Rd

TFR File #: 1

Count date: 12-Jul-2023

Weather conditions:

Clear/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Hwy 20 runs W/E

North Leg Total: 254

North Entering: 98

North Peds: 0

Peds Cross: $\times$

Heavys	1	10	4	15
Trucks	0	5	1	6
Cars	10	65	2	77
Totals	11	80	7	



Heavys	16
Trucks	3
Cars	137
Totals	156

East Leg Total: 646

East Entering: 296

East Peds: 1

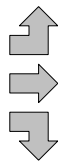
Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
25	6	297	328

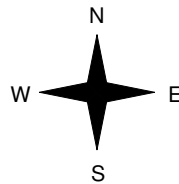


Hwy 20

Heavys	Trucks	Cars	Totals
1	0	33	34
8	3	295	306
15	2	80	97
24	5	408	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
18	0	1	19
228	5	8	241
32	2	2	36
278	7	11	

Hwy 20



Cars	Trucks	Heavys	Totals
333	5	12	350

Peds Cross: $\times$

West Peds: 0

West Entering: 437

West Leg Total: 765

Cars	177	Cars	59	86	36	181
Trucks	9	Trucks	1	3	1	5
Heavys	27	Heavys	16	14	0	30
Totals	213	Totals	76	103	37	



Peds Cross: $\times$

South Peds: 1

South Entering: 216

South Leg Total: 429

Comments

Hwy 20 @ Thorold Townline Rd

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 13:00:00

To: 14:00:00

Municipality: Thorold

Site #: 0000000001

Intersection: Hwy 20 & Thorold Townline Rd

TFR File #: 1

Count date: 12-Jul-2023

Weather conditions:

Clear/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Hwy 20 runs W/E

North Leg Total: 257

North Entering: 140

North Peds: 0

Peds Cross: $\times$

Heavys	2	11	5	18
Trucks	0	2	0	2
Cars	19	87	14	120
Totals	21	100	19	



Heavys 13

Trucks 2

Cars 102

Totals 117

East Leg Total: 686

East Entering: 327

East Peds: 0

Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
18	9	392	419

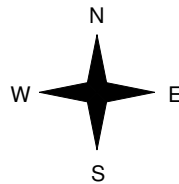


Hwy 20

Heavys	Trucks	Cars	Totals
2	0	10	12
3	6	295	304
12	3	69	84
17	9	374	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
13	0	1	14
274	5	2	281
30	2	0	32
317	7	3	



Hwy 20



Cars	Trucks	Heavys	Totals
345	6	8	359

Peds Cross: $\times$

West Peds: 0

West Entering: 400

West Leg Total: 819

Cars	186	Cars	99	79	36	214
Trucks	7	Trucks	4	2	0	6
Heavys	23	Heavys	14	10	0	24
Totals	216	Totals	117	91	36	



Peds Cross: $\times$

South Peds: 0

South Entering: 244

South Leg Total: 460

Comments

Hwy 20 @ Thorold Townline Rd

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 16:00:00

To: 17:00:00

Municipality: Thorold

Site #: 0000000001

Intersection: Hwy 20 & Thorold Townline Rd

TFR File #: 1

Count date: 12-Jul-2023

Weather conditions:

Clear/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Hwy 20 runs W/E

North Leg Total: 392

North Entering: 226

North Peds: 0

Peds Cross: $\times$

Heavys	3	9	2	14
Trucks	2	3	0	5
Cars	39	150	18	207
Totals	44	162	20	



Heavys 4

Trucks 7

Cars 155

Totals 166

East Leg Total: 1011

East Entering: 466

East Peds: 0

Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
19	10	543	572

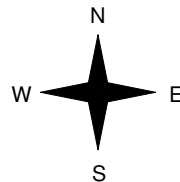


Hwy 20

Heavys	Trucks	Cars	Totals
1	1	32	34
1	6	442	449
8	5	139	152
10	12	613	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
16	0	0	16
393	6	5	404
45	1	0	46
454	7	5	

Hwy 20



Cars	Trucks	Heavys	Totals
533	7	5	545

Peds Cross: $\times$

West Peds: 0

West Entering: 635

West Leg Total: 1207

Cars	334	Cars	111	107	73	291
Trucks	9	Trucks	2	6	1	9
Heavys	17	Heavys	11	3	2	16
Totals	360	Totals	124	116	76	



Peds Cross: $\times$

South Peds: 0

South Entering: 316

South Leg Total: 676

Comments

Hwy 20 @ Thorold Townline Rd

Total Count Diagram

Municipality: Thorold

Site #: 0000000001

Intersection: Hwy 20 & Thorold Townline Rd

TFR File #: 1

Count date: 12-Jul-2023

Weather conditions:

Clear/Dry

Person(s) who counted:

Cam

**** Signalized Intersection ****

Major Road: Hwy 20 runs W/E

North Leg Total: 2524

North Entering: 1302

North Peds: 6

Peds Cross: $\times$

	Heavys	Trucks	Cars	Totals
North	16	83	26	125
East	8	22	4	34
South	198	828	117	1143
Totals	222	933	147	



	Heavys	Trucks	Cars	Totals
North	101	35	1086	1222
East	35			
South				
Totals	1222			

East Leg Total: 6458
 East Entering: 2983
 East Peds: 1
 Peds Cross: $\times$

Heavys	Trucks	Cars	Totals
168	69	3393	3630

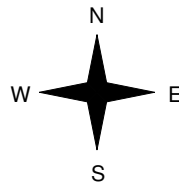


Hwy 20

Heavys	Trucks	Cars	Totals
12	4	209	225
38	39	2861	2938
107	27	791	925
157	70	3861	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
117	2	8	127
2453	41	48	2542
299	8	7	314
2869	51	63	

Hwy 20



Cars	Trucks	Heavys	Totals
3355	49	71	3475

Peds Cross: $\times$

West Peds: 0

West Entering: 4088

West Leg Total: 7718

Cars	Trucks	Heavys	Totals
1918	57	197	2172
742	20	104	866
760	29	81	870
377	6	7	390
1879	55	192	



Peds Cross: $\times$

South Peds: 5

South Entering: 2126

South Leg Total: 4298

Comments

Signal Code: 070H20**Intersection: RR70 (TOWNLINE RD.) & HWY 20 (LUNDYS LANE)****Municipality: thorold****Owner: MTO****Last Modified: 2018-03-28 11:28:16 AM**

Timing Parameters	EBD & WBD LUNDY'S LANE	NBD & SBD TOWNLINE RD.	-	n/a	-	-
Min Green	20	10	0	0	0	0
Walk	15	15	0	0	0	0
Ped Clearance	7	14	0	0	0	0
Vehicle Ext.	5	5	0	0	0	0
Max Green	50	40	0	0	0	0
Yellow	5	4	0	0	0	0
All Red	2	2	0	0	0	0

Offset

Minimum Cycle	43	0
Pedestrian Cycle	64	
Maximum Cycle	103	0
Operation	FA	

Installed On: 2001-05-02

Count Date: 2008-05-14

FA = Fully Actuated

SA = Semi Actuated

FT = Fixed Time

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Thorold Townline Rd @ Beaverdams Rd

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 10:00:00

One Hour Peak

From: 7:15:00

To: 8:15:00

Municipality: Thorold

Site #: 0000000002

Intersection: Thorold Townline Rd & Beaverdams

TFR File #: 2

Count date: 12-Jul-2023

Weather conditions:

Clear/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Thorold Townline Rd runs N/S

North Leg Total: 321

North Entering: 125

North Peds: 0

Peds Cross: $\nlessgtr$

Heavys	0	13	1	14
Trucks	3	6	3	12
Cars	25	65	9	99
Totals	28	84	13	



Heavys	16
Trucks	7
Cars	173
Totals	196

East Leg Total: 269

East Entering: 172

East Peds: 0

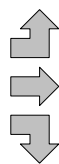
Peds Cross: $\nlessgtr$

Heavys	Trucks	Cars	Totals
1	6	191	198

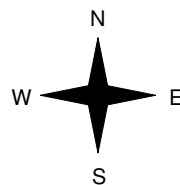


Beaverdams Rd

Heavys	Trucks	Cars	Totals
0	0	30	30
1	0	79	80
0	3	23	26
1	3	132	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
25	2	1	28
137	3	1	141
3	0	0	3
165	5	2	



Beaverdams Rd



Cars	Trucks	Heavys	Totals
92	3	2	97

Peds Cross: $\nlessgtr$

West Peds: 0

West Entering: 136

West Leg Total: 334

Cars	91	Cars	29	118	4	151
Trucks	9	Trucks	0	5	0	5
Heavys	13	Heavys	0	15	0	15
Totals	113	Totals	29	138	4	



Peds Cross: $\nlessgtr$

South Peds: 0

South Entering: 171

South Leg Total: 284

Comments

Thorold Townline Rd @ Beaverdams Rd

Mid-day Peak Diagram

Specified Period

From: 11:00:00

To: 14:00:00

One Hour Peak

From: 12:00:00

To: 13:00:00

Municipality: Thorold

Site #: 0000000002

Intersection: Thorold Townline Rd & Beaverdams

TFR File #: 2

Count date: 12-Jul-2023

Weather conditions:

Clear/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Thorold Townline Rd runs N/S

North Leg Total: 333

North Entering: 176

North Peds: 0

Peds Cross: $\nlessgtr$

Heavys	0	20	0	20
Trucks	1	2	0	3
Cars	35	92	26	153
Totals	36	114	26	



Heavys 18

Trucks 6

Cars 133

Totals 157

East Leg Total: 254

East Entering: 134

East Peds: 0

Peds Cross: $\nlessgtr$

Heavys	Trucks	Cars	Totals
4	4	157	165

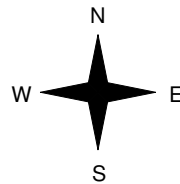


Beaverdams Rd

Heavys	Trucks	Cars	Totals
2	0	28	30
0	4	88	92
0	1	14	15
2	5	130	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
30	2	1	33
92	2	3	97
3	0	1	4
125	4	5	

Beaverdams Rd



Cars	Trucks	Heavys	Totals
116	4	0	120

Peds Cross: $\nlessgtr$

West Peds: 0

West Entering: 137

West Leg Total: 302

Cars	109	Cars	30	75	2	107
Trucks	3	Trucks	1	4	0	5
Heavys	21	Heavys	1	15	0	16
Totals	133	Totals	32	94	2	



Peds Cross: $\nlessgtr$

South Peds: 0

South Entering: 128

South Leg Total: 261

Comments

Thorold Townline Rd @ Beaverdams Rd

Afternoon Peak Diagram

Specified Period

From: 15:00:00

To: 18:00:00

One Hour Peak

From: 16:15:00

To: 17:15:00

Municipality: Thorold

Site #: 0000000002

Intersection: Thorold Townline Rd & Beaverdams

TFR File #: 2

Count date: 12-Jul-2023

Weather conditions:

Clear/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: Thorold Townline Rd runs N/S

North Leg Total: 472

North Entering: 284

North Peds: 0

Peds Cross: $\nlessgtr$

Heavys	3	9	0	12
Trucks	4	2	0	6
Cars	53	181	32	266
Totals	60	192	32	



Heavys 9

Trucks 4

Cars 175

Totals 188

East Leg Total: 416

East Entering: 189

East Peds: 0

Peds Cross: $\nlessgtr$

Heavys	Trucks	Cars	Totals
3	6	246	255

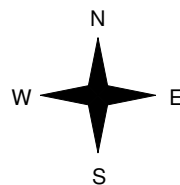


Beaverdams Rd

Heavys	Trucks	Cars	Totals
0	0	33	33
0	1	189	190
0	1	37	38
0	2	259	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
25	0	1	26
155	1	0	156
7	0	0	7
187	1	1	

Beaverdams Rd



Cars	Trucks	Heavys	Totals
226	1	0	227

Peds Cross: $\nlessgtr$

West Peds: 0

West Entering: 261

West Leg Total: 516

Cars	225	Cars	38	117	5	160
Trucks	3	Trucks	1	4	0	5
Heavys	9	Heavys	0	8	0	8
Totals	237	Totals	39	129	5	



Peds Cross: $\nlessgtr$

South Peds: 0

South Entering: 173

South Leg Total: 410

Comments

Thorold Townline Rd @ Beaverdams Rd

Total Count Diagram

Municipality: Thorold
Site #: 0000000002
Intersection: Thorold Townline Rd & Beaverdams
TFR File #: 2
Count date: 12-Jul-2023

Weather conditions:
 Clear/Dry
Person(s) who counted:
 Cam

**** Signalized Intersection ****

Major Road: Thorold Townline Rd runs N/S

North Leg Total: 3026
 North Entering: 1586
 North Peds: 0
 Peds Cross: $\nless$

Heavys	10	125	2	137
Trucks	16	31	10	57
Cars	272	922	198	1392
Totals	298	1078	210	

Heavys	114
Trucks	47
Cars	1279
Totals	1440

East Leg Total: 2474
 East Entering: 1280
 East Peds: 0
 Peds Cross: $\nless$

Heavys	Trucks	Cars	Totals
16	31	1481	1528

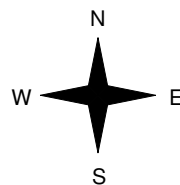


Beaverdams Rd

Heavys	Trucks	Cars	Totals
5	4	209	218
6	13	933	952
1	6	211	218
12	23	1353	



Thorold Townline Rd



Cars	Trucks	Heavys	Totals
218	8	10	236
997	10	5	1012
29	2	1	32
1244	20	16	



Beaverdams Rd



Cars	Trucks	Heavys	Totals
1163	23	8	1194

Peds Cross: $\nless$
 West Peds: 0
 West Entering: 1388
 West Leg Total: 2916

Cars	1162	Cars	212	852	32	1096
Trucks	39	Trucks	5	35	0	40
Heavys	127	Heavys	1	99	0	100
Totals	1328	Totals	218	986	32	



Peds Cross: $\nless$
 South Peds: 0
 South Entering: 1236
 South Leg Total: 2564

Comments



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts1.com

Count Name: Barker Parkway & Highway 20
Site Code: 210565
Start Date: 08/10/2023
Page No: 1

Turning Movement Data

Start Time	Highway 20 Eastbound					Highway 20 Westbound					Barker Parkway 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	14	42	0	0	56	46	8	0	0	54	3	8	0	0	11	121
7:15 AM	13	74	1	0	88	42	5	0	0	47	4	3	0	0	7	142
7:30 AM	12	26	0	0	38	58	2	0	0	60	3	15	1	0	19	117
7:45 AM	11	110	0	0	121	62	5	0	0	67	3	10	0	0	13	201
Hourly Total	50	252	1	0	303	208	20	0	0	228	13	36	1	0	50	581
8:00 AM	7	84	0	0	91	58	5	0	0	63	9	12	0	0	21	175
8:15 AM	5	84	0	0	89	44	2	0	0	46	11	9	0	0	20	155
8:30 AM	10	46	0	0	56	99	6	0	0	105	8	9	0	0	17	178
8:45 AM	9	90	0	0	99	80	5	0	0	85	3	10	0	1	13	197
Hourly Total	31	304	0	0	335	281	18	0	0	299	31	40	0	1	71	705
9:00 AM	8	77	0	0	85	62	7	0	0	69	6	7	0	0	13	167
9:15 AM	6	86	0	0	92	63	3	0	0	66	12	8	0	0	20	178
9:30 AM	5	73	0	0	78	71	7	0	0	78	10	8	0	0	18	174
9:45 AM	7	94	0	0	101	69	8	1	0	78	3	14	0	0	17	196
Hourly Total	26	330	0	0	356	265	25	1	0	291	31	37	0	0	68	715
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM	9	111	0	0	120	130	14	0	0	144	7	17	0	0	24	288
12:15 PM	22	78	0	0	100	108	9	1	0	118	7	7	0	0	14	232
12:30 PM	7	114	0	0	121	91	5	0	0	96	15	11	0	0	26	243
12:45 PM	10	112	0	0	122	98	12	2	0	112	9	13	0	0	22	256
Hourly Total	48	415	0	0	463	427	40	3	0	470	38	48	0	0	86	1019
1:00 PM	8	94	0	0	102	76	9	0	0	85	9	12	0	0	21	208
1:15 PM	10	112	0	0	122	86	6	0	0	92	8	14	0	0	22	236
1:30 PM	12	108	0	0	120	100	5	0	0	105	7	9	0	0	16	241
1:45 PM	8	88	0	0	96	93	10	1	0	104	8	12	0	0	20	220
Hourly Total	38	402	0	0	440	355	30	1	0	386	32	47	0	0	79	905
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	9	125	1	0	135	114	7	1	0	122	12	13	0	0	25	282
3:15 PM	10	112	0	0	122	107	15	0	0	122	14	14	0	0	28	272
3:30 PM	9	123	0	0	132	111	12	0	0	123	10	9	0	0	19	274
3:45 PM	7	118	0	0	125	119	16	0	0	135	9	11	0	0	20	280
Hourly Total	35	478	1	0	514	451	50	1	0	502	45	47	0	0	92	1108
4:00 PM	9	129	0	0	138	137	5	0	0	142	14	8	0	0	22	302
4:15 PM	6	140	0	0	146	145	12	0	0	157	4	6	0	0	10	313
4:30 PM	11	126	0	0	137	122	13	0	0	135	13	6	0	0	19	291
4:45 PM	10	136	0	0	146	149	8	0	0	157	13	20	0	0	33	336

Hourly Total	36	531	0	0	567	553	38	0	0	591	44	40	0	0	84	1242
5:00 PM	13	117	0	0	130	121	14	0	0	135	13	7	0	0	20	285
5:15 PM	13	146	1	0	160	128	12	0	0	140	13	12	0	0	25	325
5:30 PM	10	107	0	0	117	112	14	0	0	126	6	7	0	0	13	256
5:45 PM	8	67	0	0	75	105	11	1	0	117	8	11	0	0	19	211
Hourly Total	44	437	1	0	482	466	51	1	0	518	40	37	0	0	77	1077
Grand Total	308	3149	3	0	3460	3006	272	7	0	3285	274	332	1	1	607	7352
Approach %	8.9	91.0	0.1	-	-	91.5	8.3	0.2	-	-	45.1	54.7	0.2	-	-	-
Total %	4.2	42.8	0.0	-	47.1	40.9	3.7	0.1	-	44.7	3.7	4.5	0.0	-	8.3	-
Motorcycles	0	0	0	-	0	2	0	0	-	2	0	0	0	-	0	2
% Motorcycles	0.0	0.0	0.0	-	0.0	0.1	0.0	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	284	3075	3	-	3362	2909	266	7	-	3182	269	307	0	-	576	7120
% Cars & Light Goods	92.2	97.7	100.0	-	97.2	96.8	97.8	100.0	-	96.9	98.2	92.5	0.0	-	94.9	96.8
Buses	2	1	0	-	3	0	1	0	-	1	0	0	0	-	0	4
% Buses	0.6	0.0	0.0	-	0.1	0.0	0.4	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1
Single-Unit Trucks	19	61	0	-	80	75	4	0	-	79	5	21	1	-	27	186
% Single-Unit Trucks	6.2	1.9	0.0	-	2.3	2.5	1.5	0.0	-	2.4	1.8	6.3	100.0	-	4.4	2.5
Articulated Trucks	3	12	0	-	15	18	1	0	-	19	0	4	0	-	4	38
% Articulated Trucks	1.0	0.4	0.0	-	0.4	0.6	0.4	0.0	-	0.6	0.0	1.2	0.0	-	0.7	0.5
Bicycles on Road	0	0	0	-	0	2	0	0	-	2	0	0	0	-	0	2
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.1	0.0	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Turning Movement Data Plot



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts1.com

Count Name: Barker Parkway & Highway 20
Site Code: 210565
Start Date: 08/10/2023
Page No: 4

Turning Movement Peak Hour Data (8:30 AM)

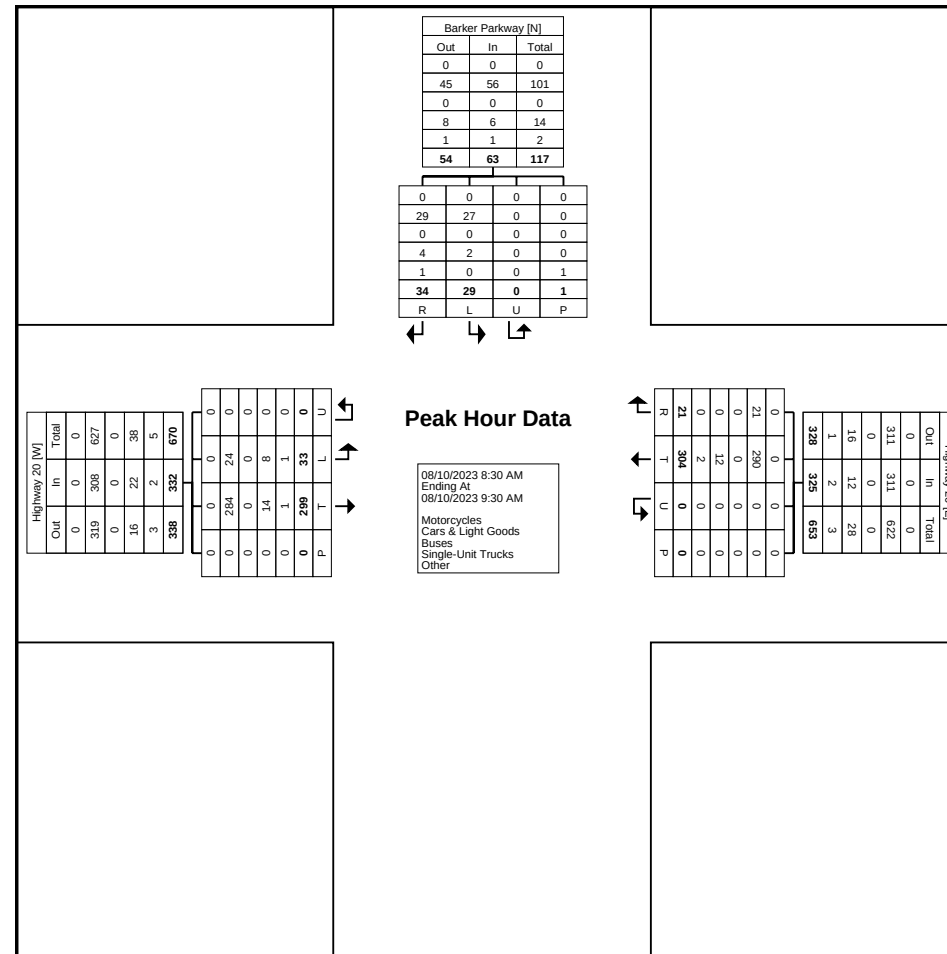
Start Time	Highway 20 Eastbound					Highway 20 Westbound					Barker Parkway Southbound					Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
8:30 AM	10	46	0	0	56	99	6	0	0	105	8	9	0	0	17	178
8:45 AM	9	90	0	0	99	80	5	0	0	85	3	10	0	1	13	197
9:00 AM	8	77	0	0	85	62	7	0	0	69	6	7	0	0	13	167
9:15 AM	6	86	0	0	92	63	3	0	0	66	12	8	0	0	20	178
Total	33	299	0	0	332	304	21	0	0	325	29	34	0	1	63	720
Approach %	9.9	90.1	0.0	-	-	93.5	6.5	0.0	-	-	46.0	54.0	0.0	-	-	-
Total %	4.6	41.5	0.0	-	46.1	42.2	2.9	0.0	-	45.1	4.0	4.7	0.0	-	8.8	-
PHF	0.825	0.831	0.000	-	0.838	0.768	0.750	0.000	-	0.774	0.604	0.850	0.000	-	0.788	0.914
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	24	284	0	-	308	290	21	0	-	311	27	29	0	-	56	675
% Cars & Light Goods	72.7	95.0	-	-	92.8	95.4	100.0	-	-	95.7	93.1	85.3	-	-	88.9	93.8
Buses	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Single-Unit Trucks	8	14	0	-	22	12	0	0	-	12	2	4	0	-	6	40
% Single-Unit Trucks	24.2	4.7	-	-	6.6	3.9	0.0	-	-	3.7	6.9	11.8	-	-	9.5	5.6
Articulated Trucks	1	1	0	-	2	2	0	0	-	2	0	1	0	-	1	5
% Articulated Trucks	3.0	0.3	-	-	0.6	0.7	0.0	-	-	0.6	0.0	2.9	-	-	1.6	0.7
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@pts1.com

Count Name: Barker Parkway & Highway 20
Site Code: 210565
Start Date: 08/10/2023
Page No: 5



Turning Movement Peak Hour Data Plot (8:30 AM)

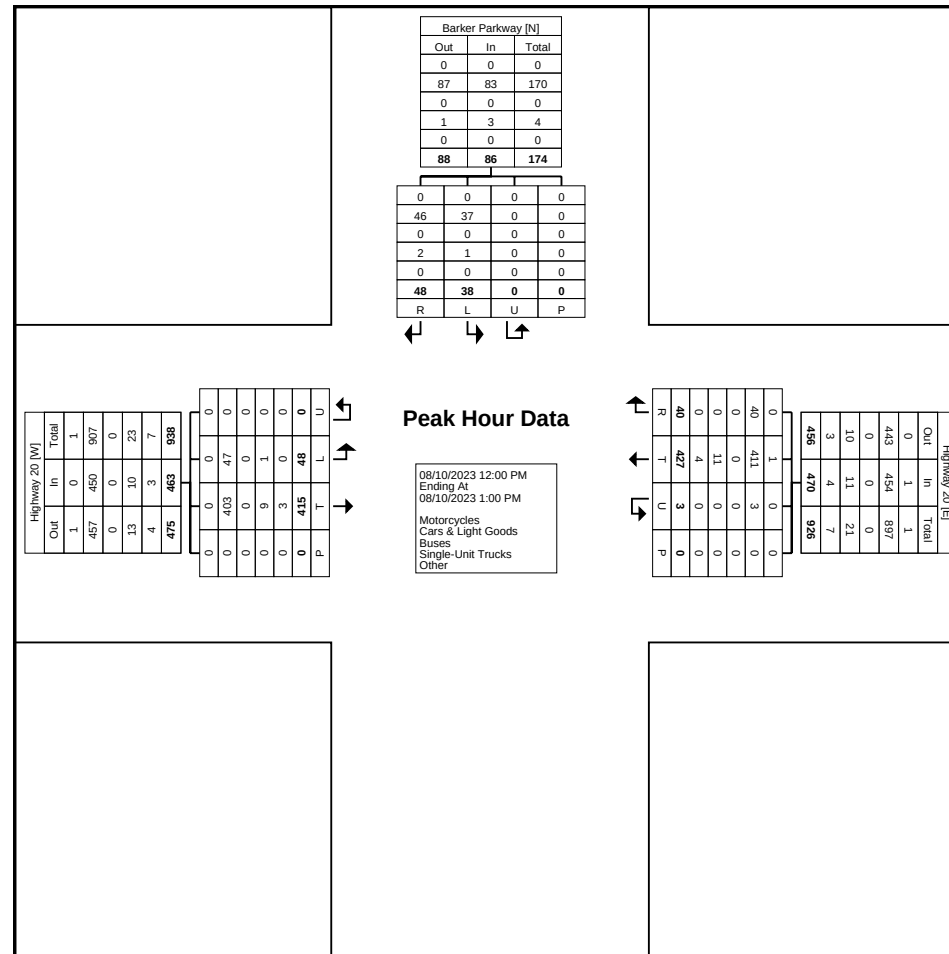
[illegible]



Paradigm Transportation Solutions Limited
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsil.com

Count Name: Barker Parkway & Highway 20
Site Code: 210565
Start Date: 08/10/2023
Page No: 7



Turning Movement Peak Hour Data Plot (12:00 PM)

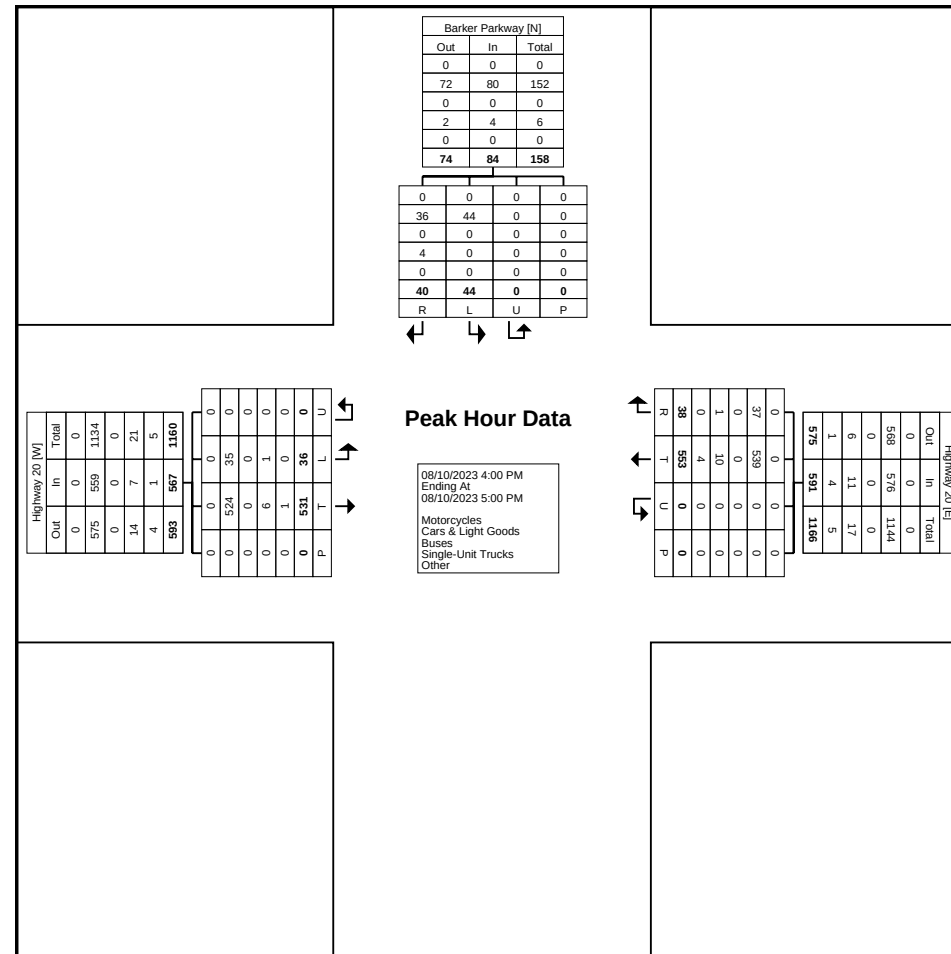
[illegible]



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5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8
519-896-3163 cbowness@ptsl.com

Count Name: Barker Parkway & Highway 20
Site Code: 210565
Start Date: 08/10/2023
Page No: 9



Turning Movement Peak Hour Data Plot (4:00 PM)

Appendix C

Base Year Operations Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖	↖	↖		↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	34	306	97	36	241	19	76	103	37	7	80	11
Future Volume (vph)	34	306	97	36	241	19	76	103	37	7	80	11
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
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			0.98	1.00								
Frt			0.850		0.989			0.961			0.982	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	1566	973	1287	1307	0	1171	1177	0	836	1156	0
Flt Permitted	0.586			0.552			0.693			0.660		
Satd. Flow (perm)	856	1566	952	747	1307	0	854	1177	0	580	1156	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			90		7			24			9	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			2628.2	
Travel Time (s)		67.4			41.9			56.4			189.2	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	37	333	105	39	262	21	83	112	40	8	87	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	37	333	105	39	283	0	83	152	0	8	99	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
Page 1

Lanes, Volumes, Timings

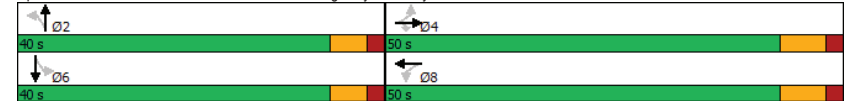
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8				2			6	
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	27.0	27.0	27.0	27.0	27.0		13.6	13.6		13.6	13.6	
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.61		0.31	0.31		0.31	0.31	
v/c Ratio	0.07	0.35	0.17	0.09	0.35		0.32	0.40		0.04	0.27	
Control Delay	6.7	8.2	3.3	7.0	8.4		15.9	14.4		11.7	13.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.7	8.2	3.3	7.0	8.4		15.9	14.4		11.7	13.3	
LOS	A	A	A	A	A		B	B		B	B	
Approach Delay		7.0			8.3			15.0			13.2	
Approach LOS		A			A			B			B	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 44												
Natural Cycle: 85												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.40												
Intersection Signal Delay: 9.6	Intersection LOS: A											
Intersection Capacity Utilization 56.4%	ICU Level of Service B											
Analysis Period (min) 15												

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
Page 2

Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023

AM Peak Hour

	↖	→	↗	↙	←	↘	↑	↖	↓
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	37	333	105	39	283	83	152	8	99
v/c Ratio	0.07	0.35	0.17	0.09	0.35	0.32	0.40	0.04	0.27
Control Delay	6.7	8.2	3.3	7.0	8.4	15.9	14.4	11.7	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.7	8.2	3.3	7.0	8.4	15.9	14.4	11.7	13.3
Queue Length 50th (m)	1.2	13.2	0.5	1.3	10.9	5.1	8.0	0.5	5.4
Queue Length 95th (m)	5.6	35.8	6.9	6.0	31.9	14.4	20.8	2.7	14.9
Internal Link Dist (m)	912.7			557.5			759.0	2604.2	
Turn Bay Length (m)	90.0	20.0		55.0	20.0		704	478	955
Base Capacity (vph)	838	1533	934	731	1280	704	975	478	955
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.22	0.11	0.05	0.22	0.12	0.16	0.02	0.10
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023

AM Peak Hour

	↖	→	↗	↙	←	↘	↖	↗	↙	↓	↘	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	34	306	97	36	241	19	76	103	37	7	80	11
Future Volume (vph)	34	306	97	36	241	19	76	103	37	7	80	11
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	1566	953	1286	1307		1171	1177		836	1156	
Flt Permitted	0.59	1.00	1.00	0.55	1.00		0.69	1.00		0.66	1.00	
Satd. Flow (perm)	856	1566	953	748	1307		854	1177		581	1156	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	333	105	39	262	21	83	112	40	8	87	12
RTOR Reduction (vph)	0	0	38	0	3	0	0	18	0	0	7	0
Lane Group Flow (vph)	37	333	67	39	280	0	83	134	0	8	92	0
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	4				8		2		6			
Permitted Phases	4		4		8		2		6			
Actuated Green, G (s)	23.1	23.1	23.1	23.1	23.1		9.2	9.2		9.2	9.2	
Effective Green, g (s)	26.1	26.1	26.1	26.1	26.1		11.2	11.2		11.2	11.2	
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58		0.25	0.25		0.25	0.25	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	493	902	549	430	753		211	291		143	285	
v/s Ratio Prot	0.21				c0.21		c0.11				0.08	
v/s Ratio Perm	0.04		0.07	0.05			0.10			0.01		
v/c Ratio	0.08	0.37	0.12	0.09	0.37		0.39	0.46		0.06	0.32	
Uniform Delay, d1	4.3	5.2	4.4	4.3	5.2		14.2	14.5		13.0	14.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.3	0.1	0.1	0.3		1.2	1.2		0.2	0.7	
Delay (s)	4.3	5.4	4.5	4.4	5.5		15.4	15.6		13.2	14.6	
Level of Service	A	A	A	A	A		B	B		B	B	
Approach Delay (s)	5.1				5.4		15.6				14.5	
Approach LOS	A				A		B				B	
Intersection Summary												
HCM 2000 Control Delay			8.2		HCM 2000 Level of Service		A					
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			45.3		Sum of lost time (s)		8.0					
Intersection Capacity Utilization			56.4%		ICU Level of Service		B					
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Base Year - 2023

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	30	80	26	28	141	3	29	138	4	13	84	28
Future Volume (vph)	30	80	26	28	141	3	29	138	4	13	84	28
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.974			0.998			0.997			0.970	
Flt Protected		0.989			0.992			0.991			0.995	
Satd. Flow (prot)	0	1389	0	0	1442	0	0	1317	0	0	1181	0
Flt Permitted		0.989			0.992			0.991			0.995	
Satd. Flow (perm)	0	1389	0	0	1442	0	0	1317	0	0	1181	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2628.2			714.3	
Travel Time (s)		30.1			38.7			189.2			51.4	
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	33	87	28	30	153	3	32	150	4	14	91	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	148	0	0	186	0	0	186	0	0	135	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			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 39.4%

ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Base Year - 2023

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	30	80	26	28	141	3	29	138	4	13	84	28
Future Volume (vph)	30	80	26	28	141	3	29	138	4	13	84	28
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)	33	87	28	30	153	3	32	150	4	14	91	30
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	148	186	186	135								
Volume Left (vph)	33	30	32	14								
Volume Right (vph)	28	3	4	30								
Hadj (s)	-0.02	0.05	0.21	0.25								
Departure Headway (s)	5.0	5.0	5.2	5.3								
Degree Utilization, x	0.21	0.26	0.27	0.20								
Capacity (veh/h)	659	665	648	626								
Control Delay (s)	9.3	9.8	10.1	9.6								
Approach Delay (s)	9.3	9.8	10.1	9.6								
Approach LOS	A	A	B	A								
Intersection Summary												
Delay		9.7										
Level of Service		A										
Intersection Capacity Utilization		39.4%										
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Base Year - 2023
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	33	408	307	21	29	34
Future Volume (vph)	33	408	307	21	29	34
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.991		0.928	
Flt Protected		0.996			0.977	
Satd. Flow (prot)	0	1147	1314	0	1208	0
Flt Permitted		0.996			0.977	
Satd. Flow (perm)	0	1147	1314	0	1208	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	36	443	334	23	32	37
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	479	357	0	69	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type: Roundabout						
Intersection Capacity Utilization 74.6%			ICU Level of Service D			
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Base Year - 2023
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	33	408	307	21	29	34
Future Volume (veh/h)	33	408	307	21	29	34
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	36	443	334	23	32	37
Approach Volume (veh/h)		479	357		69	
Crossing Volume (veh/h)		32	36		334	
High Capacity (veh/h)		1351	1346		1065	
High v/c (veh/h)		0.35	0.27		0.06	
Low Capacity (veh/h)		1130	1126		872	
Low v/c (veh/h)		0.42	0.32		0.08	
Intersection Summary						
Maximum v/c High	0.35					
Maximum v/c Low	0.42					
Intersection Capacity Utilization	74.6%			ICU Level of Service D		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Base Year - 2023
AM Peak Hour

Intersection			
Intersection Delay, s/veh	6.0		
Intersection LOS	A		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	479	357	69
Demand Flow Rate, veh/h	511	374	77
Vehicles Circulating, veh/h	34	46	351
Vehicles Exiting, veh/h	394	499	69
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	6.6	5.4	4.9
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	511	374	77
Cap Entry Lane, veh/h	1333	1317	965
Entry HV Adj Factor	0.937	0.955	0.896
Flow Entry, veh/h	479	357	69
Cap Entry, veh/h	1249	1258	864
V/C Ratio	0.383	0.284	0.080
Control Delay, s/veh	6.6	5.4	4.9
LOS	A	A	A
95th %tile Queue, veh	2	1	0

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
Page 9

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821.26/11/2015]
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:34:37 PM

Summary of intersection performance

	AM						Intersection Delay (s)	Intersection LOS
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS			
A1 - Existing								
Intersection 1 - Leg North	0.08	~1	4.18	0.07	A	4.91	A	
Intersection 1 - Leg West	0.72	1.06	5.34	0.40	A			
Intersection 1 - Leg East	0.45	~1	4.49	0.30	A			
Intersection 2 - Leg North	0.04	~1	2.13	0.04	A	2.19	A	
Intersection 2 - Leg West	0.31	~1	2.27	0.22	A			
Intersection 2 - Leg East	0.21	~1	2.09	0.17	A			
Intersection 3 - Leg North	0.02	~1	2.50	0.02	A	2.77	A	
Intersection 3 - Leg West	0.39	~1	2.93	0.27	A			
Intersection 3 - Leg East	0.24	~1	2.60	0.19	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:34:36 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Existing, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Existing, AM	Existing	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				4.91	A
2	2	Dual Lane	Roundabout	North,West,East				2.19	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				2.77	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	63.00	100.000
1	West	ONE HOUR	✓	441.00	100.000
1	East	ONE HOUR	✓	328.00	100.000

2	North	ONE HOUR	✓	63.00	100.000
2	West	ONE HOUR	✓	441.00	100.000
2	East	ONE HOUR	✓	328.00	100.000
3	North	ONE HOUR	✓	63.00	100.000
3	West	ONE HOUR	✓	441.00	100.000
3	East	ONE HOUR	✓	328.00	100.000

Turning Proportions

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

From		To			
		North	West	East	
From	North	0.000	34.000	29.000	
	West	33.000	0.000	408.000	
	East	21.000	307.000	0.000	

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

From		To			
		North	West	East	
From	North	0.00	0.54	0.46	
	West	0.07	0.00	0.93	
	East	0.06	0.94	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From		To			
		North	West	East	
From	North	0.000	34.000	29.000	
	West	33.000	0.000	408.000	
	East	21.000	307.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From		To			
		North	West	East	
From	North	0.00	0.54	0.46	
	West	0.07	0.00	0.93	
	East	0.06	0.94	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From		To			
		North	West	East	
From	North	0.000	34.000	29.000	
	West	33.000	0.000	408.000	
	East	21.000	307.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From		To			
		North	West	East	
From	North	0.00	0.54	0.46	
	West	0.07	0.00	0.93	
	East	0.06	0.94	0.00	

Vehicle Mix

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

From		To			
		North	West	East	
From	North	1.000	1.150	1.070	
	West	1.270	1.000	1.050	
	East	1.000	1.050	1.000	

Truck Percentages - Intersection 1 (for whole period)

From		To			
		North	West	East	
From	North				
	West				
	East				

From	North	0.0	15.0	7.0
	West	27.0	0.0	5.0
	East	0.0	5.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From		To			
		North	West	East	
From	North	1.000	1.150	1.070	
	West	1.270	1.000	1.050	
	East	1.000	1.050	1.000	

Truck Percentages - Intersection 2 (for whole period)

From		To			
		North	West	East	
From	North	0.0	15.0	7.0	
	West	27.0	0.0	5.0	
	East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From		To			
		North	West	East	
From	North	1.000	1.150	1.070	
	West	1.270	1.000	1.050	
	East	1.000	1.050	1.000	

Truck Percentages - Intersection 3 (for whole period)

From		To			
		North	West	East	
From	North	0.0	15.0	7.0	
	West	27.0	0.0	5.0	
	East	0.0	5.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.07	4.18	0.08	~1	A	57.81	86.71	5.79	0.06	0.06	5.79	4.00
1	West	0.40	5.34	0.72	1.06	A	404.67	607.00	48.84	4.83	0.54	48.84	4.83
1	East	0.30	4.49	0.45	~1	A	300.98	451.47	31.54	4.19	0.35	31.54	4.19
2	North	0.04	2.13	0.04	~1	A	57.81	86.71	3.00	2.07	0.03	3.00	2.07
2	West	0.22	2.27	0.31	~1	A	404.67	607.00	21.98	2.17	0.24	21.98	2.17
2	East	0.17	2.09	0.21	~1	A	300.98	451.47	15.19	2.02	0.17	15.19	2.02
3	North	0.02	2.50	0.02	~1	A	57.81	39.92	1.62	2.43	0.02	1.62	2.43
3	West	0.27	2.93	0.39	~1	A	404.67	607.00	27.99	2.77	0.31	27.99	2.77
3	East	0.19	2.60	0.24	~1	A	300.98	422.56	17.65	2.51	0.20	17.65	2.51

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	47.43		11.86			47.23	40.47	230.12	0.00	1088.51	584.91	0.044	0.00	0.05	3.844	A
1	West	332.01		83.00			330.41	255.61	21.74	0.00	1209.12	1065.87	0.275	0.00	0.40	4.350	A
1	East	246.94		61.73			245.87	327.42	24.72	0.00	1207.39	1175.54	0.205	0.00	0.27	3.915	A
2	North	47.43		11.86			47.32	40.56	230.63	0.00	2025.98	779.75	0.023	0.00	0.03	2.022	A
2	West	332.01		83.00			331.24	256.16	21.78	0.00	2176.96	1933.22	0.153	0.00	0.19	2.073	A
2	East	246.94		61.73			246.40	328.24	24.79	0.00	2174.79	2088.13	0.114	0.00	0.13	1.954	A
3	North	47.43	21.83	5.46	25.60	15.81	21.78	24.77	230.51	0.00	1650.83	578.69	0.013	0.00	0.01	2.364	A
3	West	332.01	332.01	83.00	0.00	25.60	331.05	230.51	21.78	0.00	1799.08	1403.52	0.185	0.00	0.24	2.607	A
3	East	246.94	231.13	57.78	15.81	0.00	230.51	328.05	24.77	0.00	1796.96	1739.95	0.129	0.00	0.15	2.411	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	56.64		14.16			56.59	48.49	275.73	0.00	1062.12	584.91	0.053	0.05	0.06	3.980	A
1	West	396.45		99.11			395.98	306.27	26.05	0.00	1206.62	1065.87	0.329	0.40	0.52	4.722	A
1	East	294.87		73.72			294.59	392.40	29.63	0.00	1204.55	1175.54	0.245	0.27	0.34	4.140	A
2	North	56.64		14.16			56.61	48.52	275.87	0.00	1063.27	584.91	0.053	0.05	0.06	3.980	A
2	West	396.45		99.11			396.27	306.43	26.06	0.00	1213.87	1065.87	0.329	0.40	0.52	4.722	A
2	East	294.87		73.72			294.74	392.67	29.65	0.00	1217.27	1175.54	0.245	0.27	0.34	4.140	A
3	North	56.64	26.07	6.52	30.57	18.88	26.06	29.65	275.84	0.00	1618.62	578.69	0.016	0.01	0.02	2.418	A
3	West	396.45	396.45	99.11	0.00	30.57	396.21	275.84	26.06	0.00	1796.04	1403.52	0.221	0.24	0.30	2.735	A
3	East	294.87	275.99	69.00	18.88	0.00	275.84	392.62	29.65	0.00	1793.49	1739.95	0.154	0.15	0.19	2.490	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	69.36		17.34			69.29	59.37	337.60	0.00	1026.31	584.91	0.068	0.06	0.08	4.182	A
1	West	485.55		121.39			484.77	375.00	31.90	0.00	1203.24	1065.87	0.404	0.52	0.71	5.325	A
1	East	361.13		90.28			360.70	480.39	36.27	0.00	1200.71	1175.54	0.301	0.34	0.45	4.484	A
2	North	69.36		17.34			69.33	59.42	337.85	0.00	1948.46	779.75	0.036	0.03	0.04	2.129	A
2	West	485.55		121.39			485.27	375.26	31.91	0.00	2169.64	1933.22	0.224	0.24	0.31	2.273	A
2	East	361.13		90.28			360.96	480.87	36.31	0.00	2166.46	2088.13	0.167	0.16	0.21	2.086	A
3	North	69.36	31.93	7.98	37.43	23.12	31.91	36.31	337.80	0.00	1574.62	578.69	0.020	0.02	0.02	2.496	A
3	West	485.55	485.55	121.39	0.00	37.43	485.18	337.80	31.91	0.00	1791.89	1403.52	0.271	0.30	0.39	2.930	A
3	East	361.13	338.01	84.50	23.12	0.00	337.80	480.78	36.31	0.00	1788.76	1739.95	0.189	0.19	0.24	2.605	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	69.36		17.34			69.36	59.45	338.01	0.00	1026.08	584.91	0.068	0.08	0.08	4.183	A
1	West	485.55		121.39			485.54	375.44	31.93	0.00	1203.22	1065.87	0.404	0.71	0.72	5.335	A
1	East	361.13		90.28			361.13	481.13	36.33	0.00	1200.67	1175.54	0.301	0.45	0.45	4.487	A
2	North	69.36		17.34			69.36	59.45	338.01	0.00	1948.34	779.75	0.036	0.04	0.04	2.129	A
2	West	485.55		121.39			485.55	375.45	31.93	0.00	2169.63	1933.22	0.224	0.31	0.31	2.273	A
2	East	361.13		90.28			361.13	481.14	36.33	0.00	2166.44	2088.13	0.167	0.21	0.21	2.086	A
3	North	69.36	31.93	7.98	37.43	23.12	31.93	36.33	338.01	0.00	1574.47	578.69	0.020	0.02	0.02	2.496	A
3	West	485.55	485.55	121.39	0.00	37.43	485.55	338.01	31.93	0.00	1791.87	1403.52	0.271	0.39	0.39	2.930	A
3	East	361.13	338.01	84.50	23.12	0.00	338.01	481.14	36.33	0.00	1788.74	1739.95	0.189	0.24	0.24	2.605	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	56.64		14.16			56.71	48.63	276.39	0.00	1061.74	584.91	0.053	0.08	0.06	3.982	A
1	West	396.45		99.11			397.22	306.99	26.10	0.00	1206.59	1065.87	0.329	0.72	0.52	4.735	A
1	East	294.87		73.72			295.29	393.60	29.72	0.00	1204.90	1175.54	0.245	0.45	0.34	4.147	A
2	North	56.64		14.16			56.67	48.53	276.15	0.00	1063.07	584.91	0.053	0.09	0.04	3.982	A
2	West	396.45		99.11			396.72	306.74	26.09	0.00	1213.85	1065.87	0.329	0.40	0.52	4.722	A
2	East	294.87		73.72			295.04	393.12	29.69	0.00	1217.25	1175.54	0.245	0.27	0.34	4.140	A
3	North	56.64	26.07	6.52	30.57	18.88	26.09	29.69	276.20	0.00	1618.37	578.69	0.016	0.02	0.02	2.420	A
3	West	396.45	396.45	99.11	0.00	30.57	396.82	276.20	26.09	0.00	1796.02	1403.52	0.221	0.39	0.30	2.737	A
3	East	294.87	275.99	69.00	18.88	0.00	276.20	393.21	29.69	0.00	1793.46	1739.95	0.154	0.24	0.19	2.491	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	47.43		11.86			47.48	40.71	231.39	0.00	1087.78	584.91	0.044	0.06	0.05	3.848	A
1	West	332.01		83.00			332.48	257.01	21.85	0.00	1209.05	1065.87	0.275	0.52	0.41	4.372	A
1	East	246.94		61.73			247.22	329.46	24.88	0.00	1207.30	1175.54	0.205	0.34	0.27	3.925	A
2	North	47.43		11.86			47.45	40.68	231.24	0.00	2025.54	779.75	0.023	0.03	0.03	2.024	A
2	West	332.01		83.00			332.19	256.85	21.84	0.00	2176.92	1933.22	0.153	0.24	0.19	2.077	A
2	East	246.94		61.73			247.06	329.18	24.86	0.00	2174.74	2088.13	0.114	0.16	0.13	1.954	A
3	North	47.43	21.83	5.46	25.60	15.81	21.85	24.86	231.27	0.00	1650.28	578.69	0.013	0.02	0.01	2.366	A
3	West	332.01	332.01	83.00	0.00	25.60	332.25	231.27	21.85	0.00	1799.03	1403.52	0.185	0.30	0.24	2.610	A
3	East	246.94	231.13	57.78	15.81	0.00	231.27	329.23	24.86	0.00	1796.89	1739.95	0.129	0.19	0.16	2.414	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	0.74	0.05	3.844	A	A
1	West	5.84	0.39	4.350	A	A
1	East	3.92	0.26	3.915	A	A
2	North	0.39	0.03	2.022	A	A
2	West	2.83	0.19	2.073	A	A
2	East	1.98	0.13	1.954	A	A
3	North	0.21	0.01	2.364	A	A
3	West	3.54	0.24	2.607	A	A
3	East	2.28	0.15	2.411	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	0.92	0.06	3.980	A	A
1	West	7.60	0.51	4.722	A	A
1	East	4.98	0.33	4.140	A	A
2	North	0.48	0.03	2.066	A	A
2	West	3.52	0.23	2.154	A	A
2	East	2.44	0.16	2.007	A	A
3	North	0.26	0.02	2.418	A	A
3	West	4.45	0.30	2.735	A	A
3	East	2.83	0.19	2.490	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	1.19	0.08	4.182	A	A
1	West	10.43	0.70	5.325	A	A
1	East	6.58	0.44	4.484	A	A
2	North	0.61	0.04	2.129	A	A
2	West	4.54	0.30	2.273	A	A
2	East	3.10	0.21	2.086	A	A
3	North	0.33	0.02	2.496	A	A
3	West	5.83	0.39	2.930	A	A
3	East	3.62	0.24	2.605	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	1.20	0.08	4.183	A	A
1	West	10.72	0.71	5.335	A	A
1	East	6.72	0.45	4.487	A	A
2	North	0.62	0.04	2.129	A	A
2	West	4.59	0.31	2.273	A	A
2	East	3.13	0.21	2.086	A	A
3	North	0.33	0.02	2.496	A	A
3	West	5.91	0.39	2.930	A	A
3	East	3.66	0.24	2.605	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	0.96	0.06	3.982	A	A
1	West	8.05	0.54	4.735	A	A
1	East	5.21	0.35	4.147	A	A
2	North	0.49	0.03	2.066	A	A
2	West	3.61	0.24	2.156	A	A
2	East	2.50	0.17	2.009	A	A
3	North	0.27	0.02	2.420	A	A
3	West	4.60	0.31	2.737	A	A
3	East	2.91	0.19	2.491	A	A

Queueing Delay results: (09:15-09:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	0.77	0.05	3.848	A	A

1	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
1	West	0.72	0.00	0.00	0.00	1.06	Percentiles could not be calculated. This may be because the mean queue is very small or very big.	N/A	N/A
1	East	0.45	-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
2	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
2	West	0.31	-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
2	East	0.21	-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
3	North	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
3	West	0.39	-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
3	East	0.24	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	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
1	West	0.52	-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
1	East	0.34	-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
2	North	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
2	West	0.24	-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
2	East	0.16	-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
3	North	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
3	West	0.30	-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
3	East	0.19	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	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
1	West	0.41	-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
1	East	0.27	-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
2	North	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
2	West	0.19	-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
2	East	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
3	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
3	West	0.24	-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
3	East	0.16	-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

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Queuing and Blocking Report

Base Year - 2023
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	18.0	52.2	24.8	21.2	41.7	33.3	35.6	18.8	43.8
Average Queue (m)	6.3	24.7	10.1	6.4	19.2	12.3	13.6	2.9	14.0
95th Queue (m)	15.2	44.4	21.8	15.4	34.8	26.5	27.5	12.3	30.4
Link Distance (m)	902.3			568.8			768.8		2603.2
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	90.0	20.0		55.0	20.0		20.0		
Storage Blk Time (%)	9		1	4		3	0		4
Queuing Penalty (veh)	12		2	5		2	0		0

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	23.1	20.8	34.2	27.9
Average Queue (m)	11.2	9.5	16.7	15.0
95th Queue (m)	18.4	16.9	28.0	24.4
Link Distance (m)	408.4	523.0	2603.2	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	20.5	16.8	18.9
Average Queue (m)	2.7	2.8	4.2
95th Queue (m)	11.6	11.2	13.5
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 22

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	449	152	46	404	16	124	116	76	20	162	44
Future Volume (vph)	34	449	152	46	404	16	124	116	76	20	162	44
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0			20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.994			0.940			0.968	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1348	1597	1054	1401	1341	0	1299	1226	0	1299	1246	0
Flt Permitted	0.413			0.387			0.574			0.595		
Satd. Flow (perm)	586	1597	1054	571	1341	0	785	1226	0	814	1246	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			97		3			44			18	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			2628.2	
Travel Time (s)		67.4			41.9			56.4			189.2	
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	37	488	165	50	439	17	135	126	83	22	176	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	37	488	165	50	456	0	135	209	0	22	224	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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	
Detector 1 Queue (s)	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	
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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	30.1	30.1	30.1	30.1	30.1		19.2	19.2		19.2	19.2	
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52		0.33	0.33		0.33	0.33	
v/c Ratio	0.12	0.59	0.28	0.17	0.65		0.52	0.48		0.08	0.53	
Control Delay	10.1	14.2	5.8	10.7	16.6		25.3	17.1		16.1	20.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.1	14.2	5.8	10.7	16.6		25.3	17.1		16.1	20.5	
LOS	B	B	A	B	B		C	B		B	C	
Approach Delay		11.9			16.0			20.3			20.1	
Approach LOS		B			B			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 57.9

Natural Cycle: 85

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 15.8

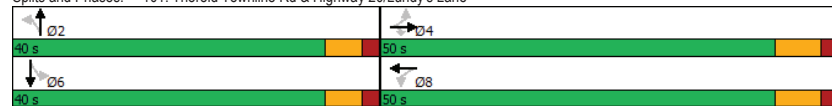
Intersection LOS: B

Intersection Capacity Utilization 82.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane



Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	37	488	165	50	456	135	209	22	224
v/c Ratio	0.12	0.59	0.28	0.17	0.65	0.52	0.48	0.08	0.53
Control Delay	10.1	14.2	5.8	10.7	16.6	25.3	17.1	16.1	20.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.1	14.2	5.8	10.7	16.6	25.3	17.1	16.1	20.5
Queue Length 50th (m)	1.7	30.5	3.2	2.4	29.8	10.0	11.7	1.4	15.1
Queue Length 95th (m)	8.3	84.6	16.4	10.9	87.0	35.1	40.2	7.6	47.9
Internal Link Dist (m)		912.7			557.5		759.0		2604.2
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	485	1324	890	473	1112	522	830	541	835
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.37	0.19	0.11	0.41	0.26	0.25	0.04	0.27

Intersection Summary

HCM Signalized Intersection Capacity Analysis
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Base Year - 2023
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	449	152	46	404	16	124	116	76	20	162	44
Future Volume (vph)	34	449	152	46	404	16	124	116	76	20	162	44
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	1597	1054	1401	1341		1299	1227		1299	1246	
Flt Permitted	0.41	1.00	1.00	0.39	1.00		0.57	1.00		0.59	1.00	
Satd. Flow (perm)	586	1597	1054	570	1341		784	1227		813	1246	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	488	165	50	439	17	135	126	83	22	176	48
RTOR Reduction (vph)	0	0	46	0	1	0	0	29	0	0	12	0
Lane Group Flow (vph)	37	488	119	50	455	0	135	180	0	22	212	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	26.9	26.9	26.9	26.9	26.9		17.1	17.1		17.1	17.1	
Effective Green, g (s)	29.9	29.9	29.9	29.9	29.9		19.1	19.1		19.1	19.1	
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52		0.34	0.34		0.34	0.34	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	307	837	552	299	703		262	411		272	417	
v/s Ratio Prot		0.31			c0.34			0.15			0.17	
v/s Ratio Perm	0.06		0.11	0.09			c0.17			0.03		
v/c Ratio	0.12	0.58	0.22	0.17	0.65		0.52	0.44		0.08	0.51	
Uniform Delay, d1	6.9	9.3	7.3	7.1	9.7		15.2	14.8		13.0	15.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	1.0	0.2	0.3	2.1		1.7	0.7		0.1	1.0	
Delay (s)	7.1	10.3	7.5	7.3	11.8		16.9	15.5		13.1	16.2	
Level of Service	A	B	A	A	B		B	B		B	B	
Approach Delay (s)		9.5			11.4			16.1			15.9	
Approach LOS		A			B			B			B	
Intersection Summary												
HCM 2000 Control Delay	12.2			HCM 2000 Level of Service					B			
HCM 2000 Volume to Capacity ratio	0.59											
Actuated Cycle Length (s)	57.0			Sum of lost time (s)					8.0			
Intersection Capacity Utilization	82.3%			ICU Level of Service					E			
Analysis Period (min)	15											
c Critical Lane Group												

Lanes, Volumes, Timings
102: Thorold Townline Rd & Beaverdams Rd

Base Year - 2023
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	33	190	38	7	156	26	39	129	5	32	192	60
Future Volume (vph)	33	190	38	7	156	26	39	129	5	32	192	60
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.982			0.996			0.972	
Flt Protected		0.994			0.998			0.989			0.994	
Satd. Flow (prot)	0	1429	0	0	1434	0	0	1360	0	0	1344	0
Flt Permitted		0.994			0.998			0.989			0.994	
Satd. Flow (perm)	0	1429	0	0	1434	0	0	1360	0	0	1344	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2628.2			714.3	
Travel Time (s)		30.1			38.7			189.2			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	36	207	41	8	170	28	42	140	5	35	209	65
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	284	0	0	206	0	0	187	0	0	309	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			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 63.4%	ICU Level of Service B											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis
102: Thorold Townline Rd & Beaverdams Rd

Base Year - 2023
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	33	190	38	7	156	26	39	129	5	32	192	60
Future Volume (vph)	33	190	38	7	156	26	39	129	5	32	192	60
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)	36	207	41	8	170	28	42	140	5	35	209	65
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	284	206	187	309								
Volume Left (vph)	36	8	42	35								
Volume Right (vph)	41	28	5	65								
Hadj (s)	-0.04	-0.05	0.15	0.01								
Departure Headway (s)	5.8	5.9	6.1	5.7								
Degree Utilization, x	0.45	0.34	0.32	0.49								
Capacity (veh/h)	575	537	522	583								
Control Delay (s)	13.4	11.9	11.9	14.2								
Approach Delay (s)	13.4	11.9	11.9	14.2								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay	13.1											
Level of Service	B											
Intersection Capacity Utilization	63.4%			ICU Level of Service			B					
Analysis Period (min)	15											

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Base Year - 2023
PM Peak Hour

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (vph)	36	591	534	38	44	40
Future Volume (vph)	36	591	534	38	44	40
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991		0.936		
Flt Protected		0.997		0.974		
Satd. Flow (prot)	0	1211	1335	0	1291	0
Flt Permitted		0.997		0.974		
Satd. Flow (perm)	0	1211	1335	0	1291	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	39	642	580	41	48	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	681	621	0	91	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	106.7%			ICU Level of Service G		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Base Year - 2023
PM Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	36	591	534	38	44	40
Future Volume (veh/h)	36	591	534	38	44	40
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	39	642	580	41	48	43
Approach Volume (veh/h)	681	621	91			
Crossing Volume (veh/h)	48	39	580			
High Capacity (veh/h)	1334	1343	875			
High v/c (veh/h)	0.51	0.46	0.10			
Low Capacity (veh/h)	1115	1123	703			
Low v/c (veh/h)	0.61	0.55	0.13			
Intersection Summary						
Maximum v/c High	0.51					
Maximum v/c Low	0.61					
Intersection Capacity Utilization	106.7%		ICU Level of Service		G	

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Base Year - 2023
PM Peak Hour

Intersection			
Intersection Delay, s/veh	8.0		
Intersection LOS	A		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	681	621	91
Demand Flow Rate, veh/h	688	639	95
Vehicles Circulating, veh/h	48	40	597
Vehicles Exiting, veh/h	644	696	82
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.4	7.8	6.4
Approach LOS	A	A	A
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	688	639	95
Cap Entry Lane, veh/h	1314	1325	751
Entry HV Adj Factor	0.989	0.971	0.958
Flow Entry, veh/h	681	621	91
Cap Entry, veh/h	1300	1287	719
V/C Ratio	0.524	0.482	0.127
Control Delay, s/veh	8.4	7.8	6.4
LOS	A	A	A
95th %tile Queue, veh	3	3	0

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:32:30 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
A1 - Existing							
Intersection 1 - Leg North	0.12	~1	4.77	0.10	A	6.75	A
Intersection 1 - Leg West	1.37	1.01	7.23	0.58	A		
Intersection 1 - Leg East	1.13	?	6.52	0.53	A		
Intersection 2 - Leg North	0.06	~1	2.25	0.05	A	2.44	A
Intersection 2 - Leg West	0.47	1.01	2.48	0.32	A		
Intersection 2 - Leg East	0.42	~1	2.42	0.29	A		
Intersection 3 - Leg North	0.04	~1	2.67	0.03	A	3.19	A
Intersection 3 - Leg West	0.64	1.01	3.34	0.39	A		
Intersection 3 - Leg East	0.50	1.03	3.09	0.33	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:32:29 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - Existing, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Existing, PM	Existing	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				6.75	A
2	2	Dual Lane	Roundabout	North,West,East				2.44	A
3	3	Single Lane - Chanzelized Rights	Roundabout	North,West,East				3.19	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	84.00	100.000
1	West	ONE HOUR	✓	627.00	100.000
1	East	ONE HOUR	✓	572.00	100.000

2	North	ONE HOUR	✓	84.00	100.000
2	West	ONE HOUR	✓	627.00	100.000
2	East	ONE HOUR	✓	572.00	100.000
3	North	ONE HOUR	✓	84.00	100.000
3	West	ONE HOUR	✓	627.00	100.000
3	East	ONE HOUR	✓	572.00	100.000

Turning Proportions

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

From	To		
	North	West	East
	North	0.000	40.000
	West	36.000	0.000

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

From	To		
	North	West	East
	North	0.00	0.48
	West	0.06	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To		
	North	West	East
	North	0.000	40.000
	West	36.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To		
	North	West	East
	North	0.00	0.48
	West	0.06	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To		
	North	West	East
	North	0.000	40.000
	West	36.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To		
	North	West	East
	North	0.00	0.48
	West	0.06	0.00

Vehicle Mix

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

From	To		
	North	West	East
	North	1.000	1.100
	West	1.030	1.000

Truck Percentages - Intersection 1 (for whole period)

	To		
	North	West	East

From	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
	East	3.0	3.0	0.0

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.10	4.77	0.12	~1	A	77.08	115.62	8.49	4.41	0.09	8.49	4.41
1	West	0.58	7.23	1.37	1.01	A	575.35	863.02	86.71	6.03	0.96	86.72	6.03
1	East	0.53	6.52	1.13	?	A	524.88	787.32	73.45	5.60	0.82	73.46	5.60
2	North	0.05	2.25	0.06	~1	A	77.08	115.62	4.13	2.15	0.05	4.13	2.15
2	West	0.32	2.48	0.47	1.01	A	575.35	863.02	33.25	2.31	0.37	33.25	2.31
2	East	0.29	2.42	0.42	~1	A	524.88	787.32	29.80	2.27	0.33	29.80	2.27
3	North	0.03	2.67	0.04	~1	A	77.08	60.56	2.56	0.54	0.03	2.56	0.54
3	West	0.39	3.34	0.64	1.01	A	575.35	863.02	43.78	3.04	0.49	43.78	3.04
3	East	0.33	3.09	0.50	1.03	A	524.88	735.01	35.20	2.87	0.39	35.20	2.87

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	63.24		15.81			62.96	55.41	399.90	0.00	990.25	580.38	0.064	0.00	0.07	4.057	A
1	West	472.04		118.01			469.45	429.88	32.98	0.00	1202.62	1045.75	0.393	0.00	0.65	4.948	A
1	East	430.63		107.66			428.36	475.47	26.95	0.00	1206.10	1186.95	0.357	0.00	0.57	4.755	A
2	North	63.24		15.81			63.10	55.58	401.08	0.00	1902.75	766.11	0.033	0.00	0.04	2.045	A
2	West	472.04		118.01			470.92	431.12	33.05	0.00	2168.82	1902.60	0.218	0.00	0.28	2.143	A
2	East	430.63		107.66			429.62	476.93	27.04	0.00	2173.16	2113.74	0.198	0.00	0.25	2.125	A
3	North	63.24	33.13	8.28	30.11	28.61	33.04	27.02	400.84	0.00	1529.84	566.61	0.022	0.00	0.02	2.404	A
3	West	472.04	472.04	118.01	0.00	30.11	470.60	400.84	33.04	0.00	1791.09	1412.10	0.264	0.00	0.36	2.754	A
3	East	430.63	402.02	100.51	28.61	0.00	400.84	476.61	27.02	0.00	1795.36	1756.96	0.224	0.00	0.30	2.656	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	75.51		18.88			75.44	66.42	479.33	0.00	944.28	580.38	0.080	0.07	0.09	4.330	A
1	West	563.66		140.92			562.70	515.25	39.51	0.00	1198.83	1045.75	0.470	0.65	0.89	5.714	A
1	East	514.22		128.55			513.44	569.91	32.31	0.00	1203.00	1186.95	0.427	0.57	0.76	5.372	A
2	North	75.51		18.88			75.48	66.49	479.81	0.00	1845.83	766.11	0.041	0.04	0.04	2.125	A
2	West	563.66		140.92			563.36	515.75	39.54	0.00	2164.13	1902.60	0.260	0.28	0.35	2.273	A
2	East	514.22		128.55			513.96	570.55	32.35	0.00	2169.33	2113.74	0.237	0.25	0.32	2.239	A
3	North	75.51	39.56	9.89	35.96	34.16	39.53	32.34	479.74	0.00	1473.80	566.61	0.027	0.02	0.03	2.509	A
3	West	563.66	563.66	140.92	0.00	35.96	563.25	479.74	39.53	0.00	1786.47	1412.10	0.316	0.36	0.46	2.976	A
3	East	514.22	480.06	120.01	34.16	0.00	479.74	570.44	32.34	0.00	1791.58	1756.96	0.268	0.30	0.38	2.826	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	92.49		23.12			92.36	81.27	586.59	0.00	882.20	580.38	0.105	0.09	0.12	4.764	A
1	West	690.34		172.58			688.44	630.57	48.38	0.00	1193.70	1045.75	0.578	0.89	1.36	7.176	A
1	East	629.78		157.45			628.34	697.29	39.53	0.00	1198.82	1186.95	0.525	0.76	1.12	6.482	A
2	North	92.49		23.12			92.43	81.42	587.56	0.00	1767.93	766.11	0.052	0.04	0.06	2.245	A
2	West	690.34		172.58			689.86	631.58	48.42	0.00	2157.71	1902.60	0.320	0.35	0.47	2.480	A
2	East	629.78		157.45			629.37	698.67	39.61	0.00	2164.07	2113.74	0.291	0.32	0.42	2.416	A
3	North	92.49	48.44	12.11	44.04	41.84	48.41	39.60	587.44	0.00	1397.31	566.61	0.035	0.03	0.04	2.668	A
3	West	690.34	690.34	172.58	0.00	44.04	689.65	587.44	48.41	0.00	1780.17	1412.10	0.388	0.64	0.64	3.336	A
3	East	629.78	587.94	146.99	41.84	0.00	587.44	698.46	39.60	0.00	1786.43	1756.96	0.329	0.38	0.50	3.090	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	92.49		23.12			92.48	81.47	587.91	0.00	881.44	580.38	0.105	0.12	0.12	4.769	A
1	West	690.34		172.58			690.29	631.95	48.44	0.00	1193.66	1045.75	0.578	1.36	1.37	7.231	A
1	East	629.78		157.45			629.75	699.10	39.63	0.00	1198.76	1186.95	0.525	1.12	1.13	6.516	A
2	North	92.49		23.12			92.49	81.48	587.94	0.00	1767.66	766.11	0.052	0.06	0.06	2.245	A
2	West	690.34		172.58			690.34	631.98	48.44	0.00	2157.69	1902.60	0.320	0.47	0.47	2.480	A
2	East	629.78		157.45			629.78	699.14	39.64	0.00	2164.06	2113.74	0.291	0.42	0.42	2.416	A
3	North	92.49	48.44	12.11	44.04	41.84	48.44	39.64	587.94	0.00	1396.95	566.61	0.035	0.04	0.04	2.669	A
3	West	690.34	690.34	172.58	0.00	44.04	690.33	587.94	48.44	0.00	1780.14	1412.10	0.388	0.64	0.64	3.339	A
3	East	629.78	587.94	146.99	41.84	0.00	587.94	699.14	39.64	0.00	1786.40	1756.96	0.329	0.50	0.50	3.093	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	75.51		18.88			75.64	66.73	481.38	0.00	943.10	580.38	0.080	0.12	0.09	4.339	A
1	West	563.66		140.92			565.52	517.40	39.62	0.00	1198.77	1045.75	0.470	1.37	0.91	5.764	A
1	East	514.22		128.55			515.63	572.67	32.47	0.00	1202.91	1186.95	0.427	1.13	0.78	5.405	A
2	North	75.51		18.88			75.57	66.58	480.43	0.00	1845.38	766.11	0.041	0.06	0.04	2.125	A
2	West	563.66		140.92			564.13	516.42	39.58	0.00	2164.09	1902.60	0.260	0.47	0.36	2.275	A
2	East	514.22		128.55			514.62	571.32	32.39	0.00	2169.29	2113.74	0.237	0.42	0.32	2.241	A
3	North	75.51	39.56	9.89	35.96	34.16	39.59	32.40	480.56	0.00	1473.22	566.61	0.027	0.04	0.03	2.512	A
3	West	563.66	563.66	140.92	0.00	35.96	564.34	480.56	39.59	0.00	1786.43	1412.10	0.316	0.64	0.47	2.979	A
3	East	514.22	480.06	120.01	34.16	0.00	480.56	571.53	32.40	0.00	1791.54	1756.96	0.268	0.50	0.38	2.831	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE/hr)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	63.24		15.81			63.32	55.82	402.77	0.00	888.59	580.38	0.064	0.09	0.07	4.065	A
	West	472.04		118.01			473.03	422.92	33.17	0.00	1202.51	1045.75	0.393	0.91	0.66	4.986	A
	East	430.63		107.66			431.43	479.04	27.16	0.00	1205.98	1186.95	0.357	0.78	0.58	4.791	A
2	North	63.24		15.81			63.27	55.75	402.27	0.00	1901.89	766.11	0.033	0.04	0.04	2.046	A
	West	472.04		118.01			473.24	432.40	33.14	0.00	2168.75	1902.60	0.218	0.36	0.28	2.145	A
	East	430.66		107.66			430.89	479.12	27.12	0.00	2170.79	2118.36	0.198	0.37	0.30	2.138	A
3	North	63.24	8.28	30.11	26.61		33.15	27.13	402.34	0.00	1528.77	566.61	0.022	0.03	0.02	2.408	A
	West	472.04	472.04	118.01	0.00	30.11	472.46	402.34	33.15	0.00	1791.01	1412.10	0.264	0.47	0.36	2.760	A
	East	430.63	402.02	100.51	26.61	0.00	402.34	478.48	27.13	0.00	1795.28	1756.96	0.224	0.38	0.30	2.664	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North		0.07	4.057	A	A
1	West	9.40	0.63	4.948	A	A
1	East	8.25	0.55	4.755	A	A
2	North	0.53	0.04	2.045	A	A
2	West	4.15	0.28	2.143	A	A
2	East	3.75	0.25	2.125	A	A
3	North	0.33	0.02	2.404	A	A
3	West	5.31	0.35	2.754	A	A
3	East	4.37	0.29	2.656	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	1.34	0.09	4.330	A	A
1	West	12.95	0.86	5.714	A	A
1	East	11.14	0.74	5.372	A	A
2	North	0.66	0.04	2.125	A	A
2	West	5.27	0.35	2.273	A	A
2	East	4.73	0.32	2.239	A	A
3	North	0.41	0.03	2.509	A	A
3	West	6.86	0.46	2.976	A	A
3	East	5.56	0.37	2.826	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	1.79	0.12	4.764	A	A
1	West	19.63	1.31	7.176	A	A
1	East	16.29	1.09	6.482	A	A
2	North	0.86	0.06	2.245	A	A
2	West	7.02	0.47	2.480	A	A
2	East	6.24	0.42	2.416	A	A
3	North	0.53	0.04	2.668	A	A
3	West	9.38	0.63	3.336	A	A
3	East	7.43	0.50	3.090	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	1.83	0.12	4.769	A	A
1	West	20.54	1.37	7.231	A	A
1	East	16.93	1.13	6.516	A	A
2	North	0.86	0.06	2.245	A	A
2	West	7.12	0.47	2.480	A	A
2	East	6.33	0.42	2.416	A	A
3	North	0.54	0.04	2.669	A	A
3	West	9.57	0.64	3.339	A	A
3	East	7.55	0.50	3.093	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	1.39	0.09	4.339	A	A
1	West	14.07	0.94	5.764	A	A
1	East	11.99	0.80	5.405	A	A
2	North	0.68	0.05	2.125	A	A
2	West	5.43	0.36	2.275	A	A
2	East	4.87	0.32	2.241	A	A
3	North	0.42	0.03	2.512	A	A
3	West	7.14	0.48	2.979	A	A
3	East	5.76	0.38	2.831	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	1.09	0.07	4.068	A	A

1	West	10.14	0.68	4.996	A	A
1	East	8.85	0.59	4.791	A	A
2	North	0.55	0.04	2.046	A	A
2	West	4.28	0.29	2.145	A	A
2	East	3.87	0.26	2.129	A	A
3	North	0.34	0.02	2.408	A	A
3	West	5.52	0.37	2.760	A	A
3	East	4.53	0.30	2.664	A	A

Queue Variation Results for each time segment

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q80 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	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
1	West	0.65	-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
1	East	0.57	-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
2	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
2	West	0.28	-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
2	East	0.25	-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
3	North	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
3	West	0.36	-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
3	East	0.30	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q80 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	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
1	West	0.89	0.00	0.00	1.01	1.01			N/A	N/A
1	East	0.76	-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
2	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
2	West	0.35	-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
2	East	0.32	-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
3	North	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
3	West	0.46	-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
3	East	0.38	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q80 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.12	-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
1	West	1.36	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	1.12	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	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
2	West	0.47	-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
2	East	0.42	-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
3	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
3	West	0.64	-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
3	East	0.50	-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

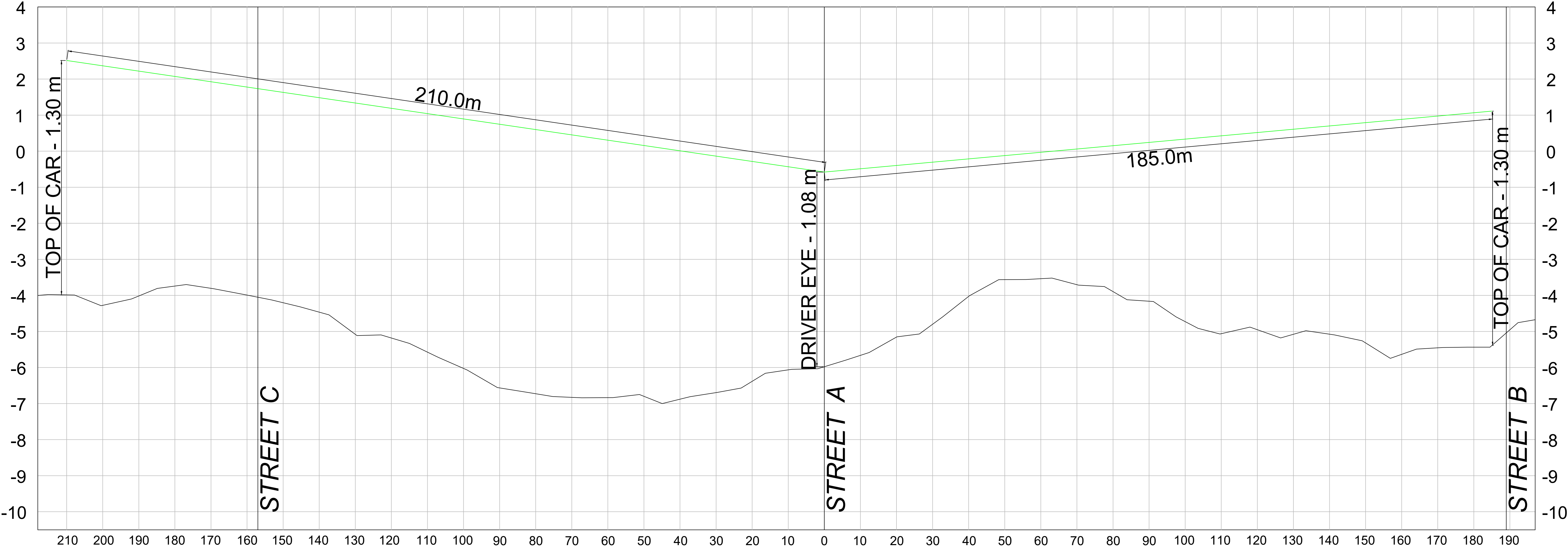
Queue Variation results: (16:45-17:00)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q80 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.12	-1	-1	-1	-1	Percentiles could not be calculated. This may be		N/A	N/A

Appendix D

Sight Distance Assessment





VERTICAL EXAGGERATION 50:1

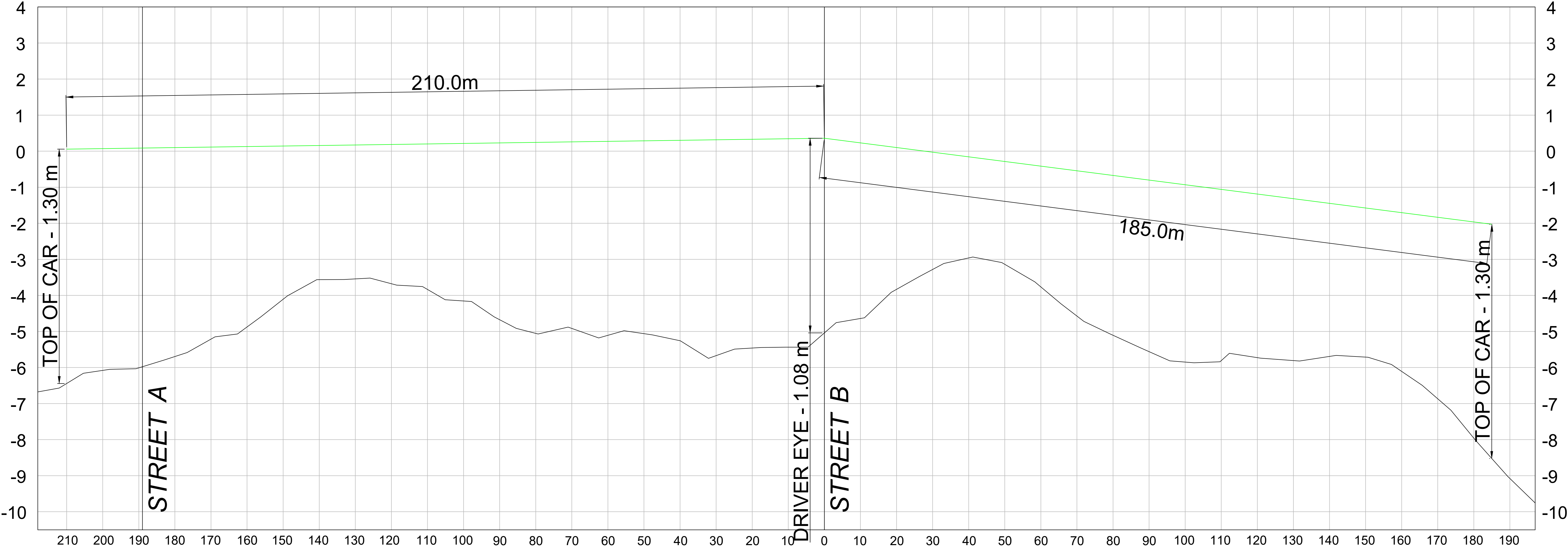
Street A

NO.	DATE	INITIAL	REVISION DETAIL
DRAWING STATUS			
ISSUED FOR REVIEW			
APPROVED	DATE: _____		
SIGNATURE _____			



SIGHT DISTANCE ASSESSMENT
THOROLD TOWNLINE ROAD
THOROLD, ON

PROJECT NO.: 210565	DATE: OCTOBER 2023	SCALE: 1:550	DRAWING NO.:
DRAWN: LC	DESIGN: LC	CHECK: SC	01



VERTICAL EXAGGERATION 50:1

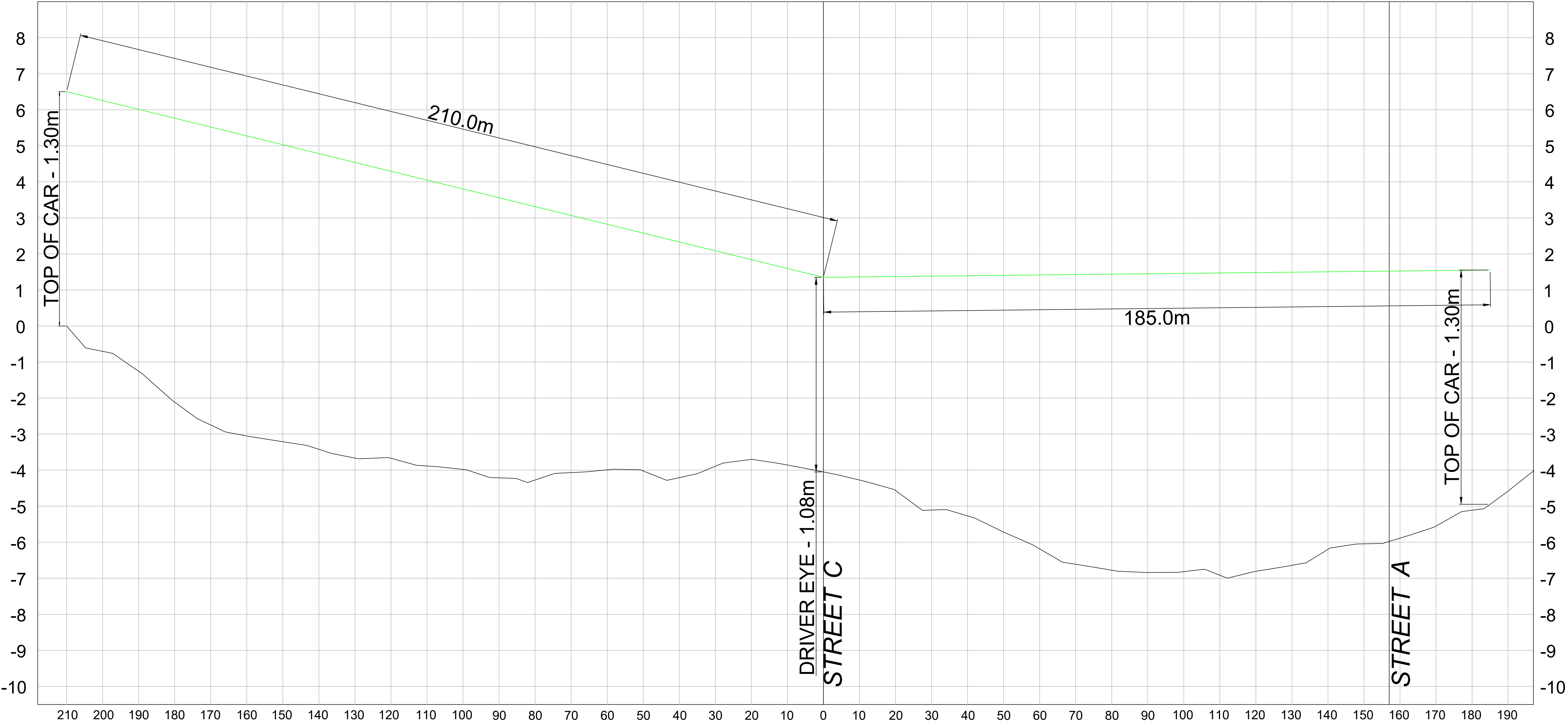
Street B

NO.	DATE	INITIAL	REVISION DETAIL
DRAWING STATUS			
ISSUED FOR REVIEW			
APPROVED	DATE: _____		
SIGNATURE _____			



SIGHT DISTANCE ASSESSMENT
THOROLD TOWNLINE ROAD
THOROLD, ON

PROJECT NO.: 210565	DATE: OCTOBER 2023	SCALE: 1:550	DRAWING NO.:
DRAWN: LC	DESIGN: LC	CHECK: SC	02



VERTICAL EXAGGERATION 50:1

Street C

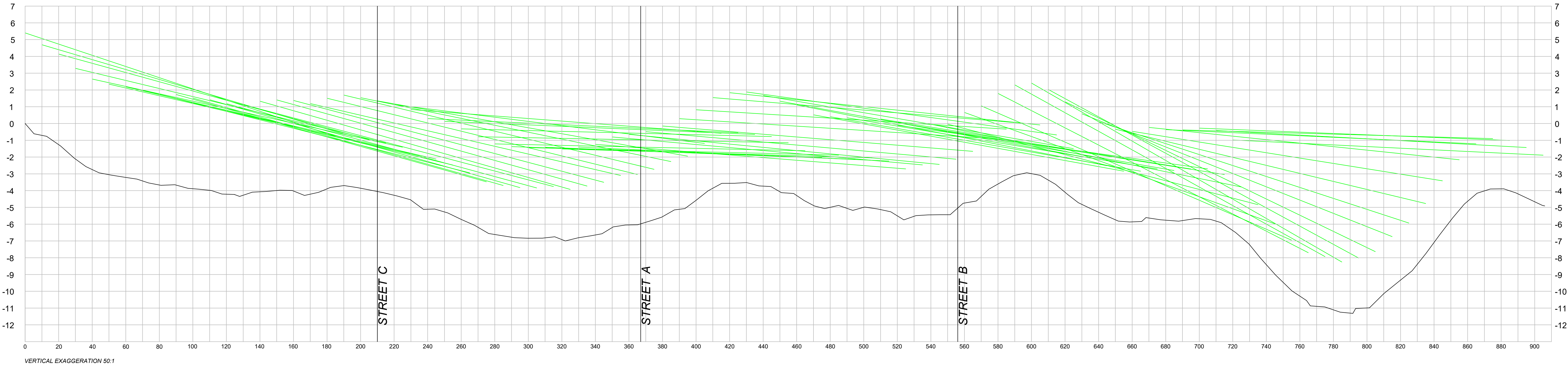
NO.	DATE	INITIAL	REVISION DETAIL
DRAWING STATUS			
ISSUED FOR REVIEW			
APPROVED	DATE: _____		
SIGNATURE _____			



SIGHT DISTANCE ASSESSMENT
THOROLD TOWNLINE ROAD
THOROLD, ON

PROJECT NO.: 210565	DATE: OCTOBER 2023	SCALE: 1:550	DRAWING NO.:
DRAWN: LC	DESIGN: LC	CHECK: SC	03

STOPPING SIGHT DISTANCE - EASTBOUND



Vertical Profile Sight Line Report

Eye Height: 1.08 m
Vertical Exaggeration: 50.0:1
Object Height: 0.80 m
Stopping Sight Distance: 185.00 m
Interval Distance: 10.00 m

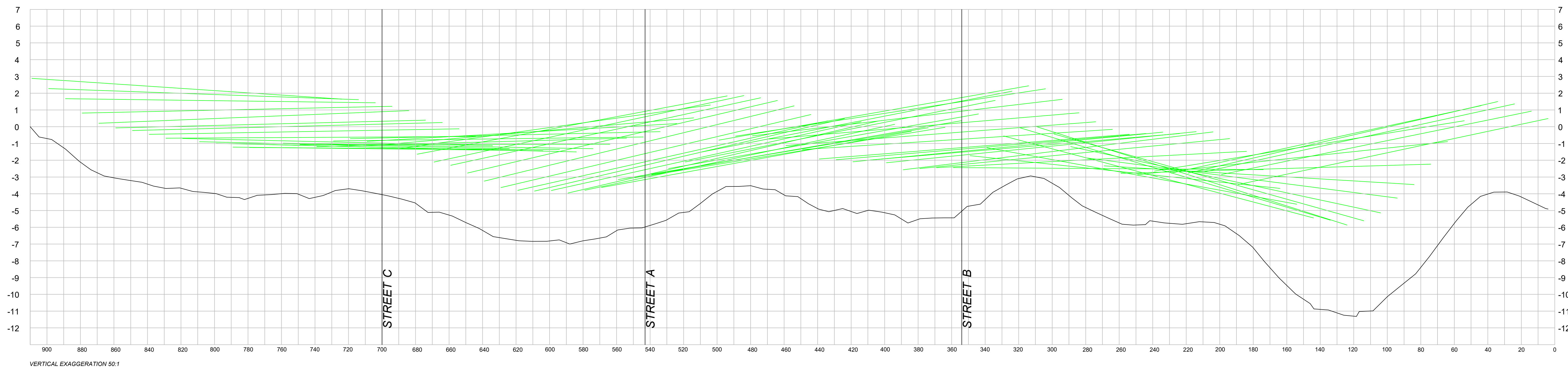
NO.	DATE	INITIAL	REVISION DETAIL
DRAWING STATUS			
ISSUED FOR REVIEW			
APPROVED		DATE: _____	
_____ SIGNATURE			



SIGHT DISTANCE ASSESSMENT
THOROLD TOWNLINE ROAD
THOROLD, ON

PROJECT NO.: 210565	DATE: OCTOBER 2023	SCALE: 1:1150	DRAWING NO.:
DRAWN: LC	DESIGN: LC	CHECK: SC	04

STOPPING SIGHT DISTANCE - WESTBOUND



Vertical Profile Sight Line Report

Eye Height: 1.08 m
Vertical Exaggeration: 50.0:1
Object Height: 0.80 m
Stopping Sight Distance: 185.00 m
Interval Distance: 10.00 m

NO.	DATE	INITIAL	REVISION DETAIL
DRAWING STATUS			
ISSUED FOR REVIEW			
APPROVED		DATE: _____	
_____ SIGNATURE			



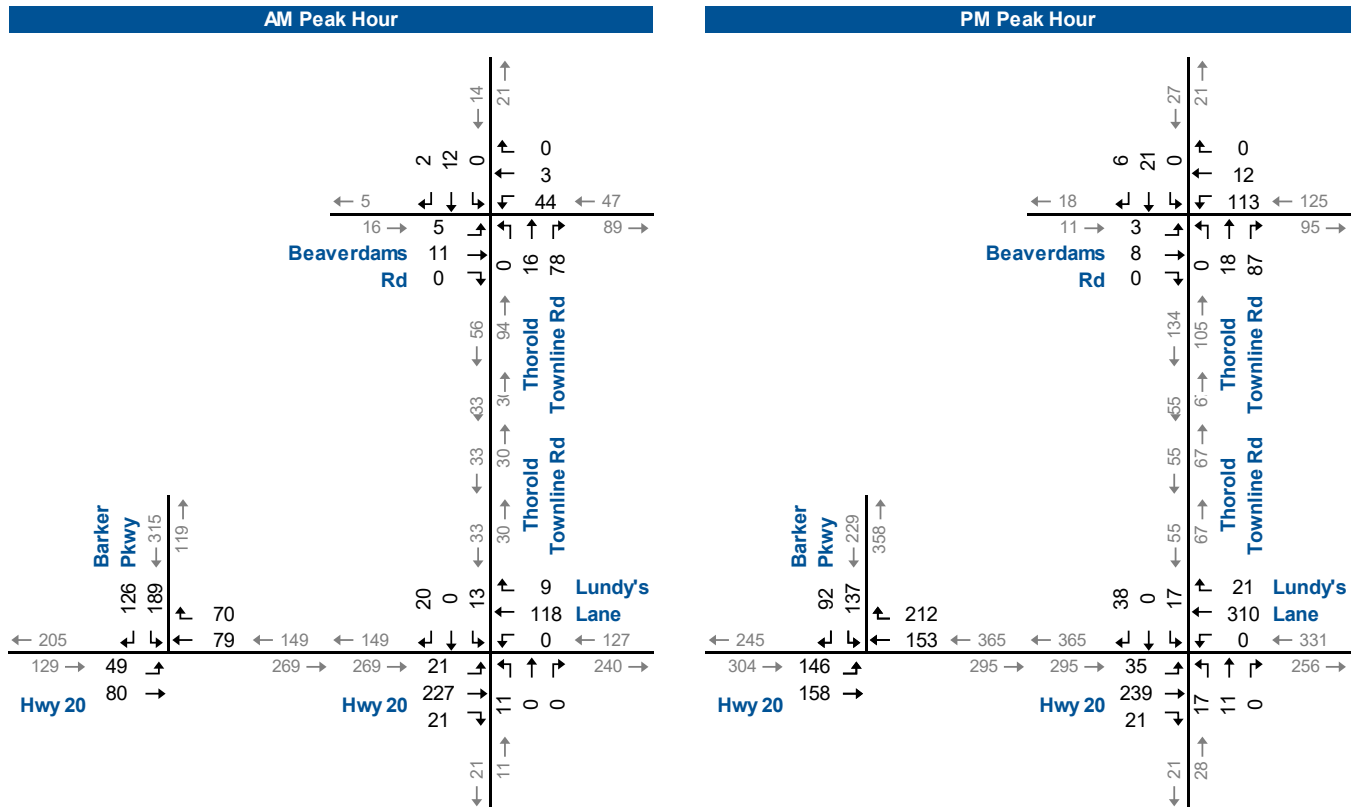
SIGHT DISTANCE ASSESSMENT
THOROLD TOWNLINE ROAD
THOROLD, ON

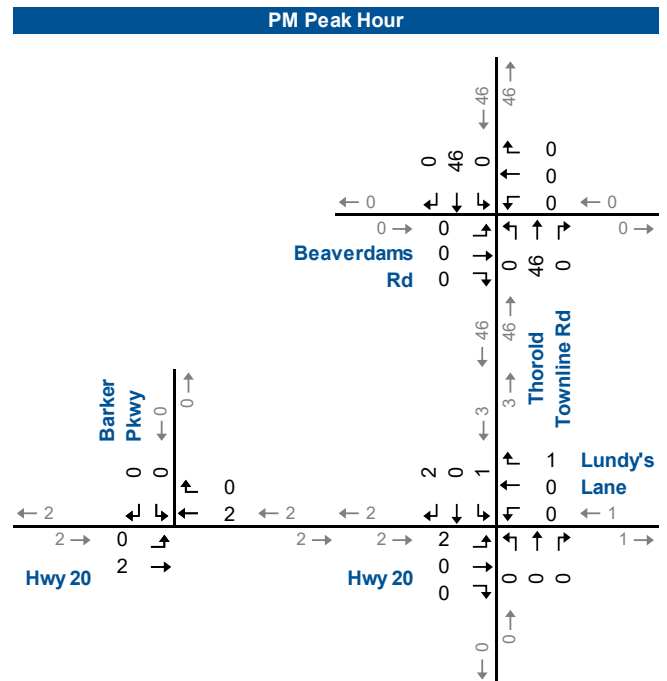
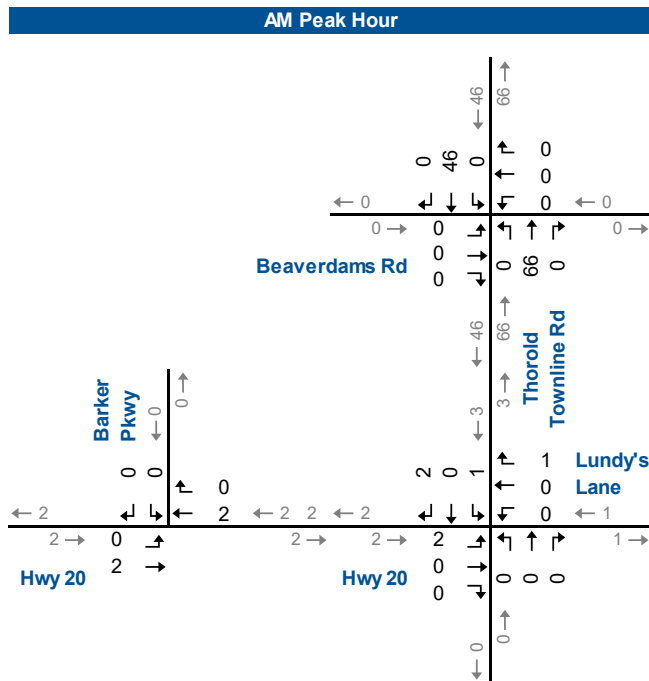
PROJECT NO.: 210565	DATE: OCTOBER 2023	SCALE: 1:1150	DRAWING NO.:
DRAWN: LC	DESIGN: LC	CHECK: SC	05

Appendix E

Background Development Traffic Volumes







Appendix F1

2030 Background Operations Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖	↖	↖		↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	62	578	132	41	395	32	98	118	43	22	92	34
Future Volume (vph)	62	578	132	41	395	32	98	118	43	22	92	34
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0			0.0	20.0		0.0	20.0	0.0
Storage Lanes	1		1	1			0	1		0	1	0
Taper Length (m)	100.0			80.0			50.0			50.0		
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			0.98	1.00								
Frt			0.850		0.989			0.960			0.959	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	1566	973	1287	1307	0	1171	1177	0	836	1142	0
Flt Permitted	0.425			0.303			0.669			0.634		
Satd. Flow (perm)	621	1566	952	410	1307	0	825	1177	0	558	1142	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			65		7			24			25	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			2628.2	
Travel Time (s)		67.4			41.9			56.4			189.2	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	67	628	143	45	429	35	107	128	47	24	100	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	67	628	143	45	464	0	107	175	0	24	137	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
Page 1

Lanes, Volumes, Timings

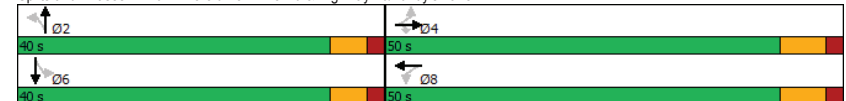
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	32.3	32.3	32.3	32.3	32.3		16.9	16.9		16.9	16.9	
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56		0.29	0.29		0.29	0.29	
v/c Ratio	0.19	0.72	0.25	0.20	0.63		0.44	0.48		0.15	0.39	
Control Delay	8.6	15.4	5.6	9.6	13.7		25.6	21.4		20.5	19.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.6	15.4	5.6	9.6	13.7		25.6	21.4		20.5	19.2	
LOS	A	B	A	A	B		C	C		C	B	
Approach Delay		13.2			13.3			23.0			19.4	
Approach LOS		B			B			C			B	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 57.6												
Natural Cycle: 85												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.72												
Intersection Signal Delay: 15.3												
Intersection LOS: B												
Intersection Capacity Utilization 85.9%												
ICU Level of Service E												
Analysis Period (min) 15												

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	67	628	143	45	464	107	175	24	137
v/c Ratio	0.19	0.72	0.25	0.20	0.63	0.44	0.48	0.15	0.39
Control Delay	8.6	15.4	5.6	9.6	13.7	25.6	21.4	20.5	19.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.6	15.4	5.6	9.6	13.7	25.6	21.4	20.5	19.2
Queue Length 50th (m)	3.0	41.8	3.4	2.0	28.1	8.8	12.4	1.8	8.9
Queue Length 95th (m)	11.2	103.7	13.9	8.8	74.0	28.2	37.3	8.6	28.6
Internal Link Dist (m)		912.7			557.5		759.0		2604.2
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	512	1291	796	338	1078	544	784	368	761
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.49	0.18	0.13	0.43	0.20	0.22	0.07	0.18

Intersection Summary

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	62	578	132	41	395	32	98	118	43	22	92	34
Future Volume (vph)	62	578	132	41	395	32	98	118	43	22	92	34
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	1566	952	1287	1307		1171	1176		836	1142	
Flt Permitted	0.43	1.00	1.00	0.30	1.00		0.67	1.00		0.63	1.00	
Satd. Flow (perm)	621	1566	952	411	1307		825	1176		558	1142	
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)	67	628	143	45	429	35	107	128	47	24	100	37
RTOR Reduction (vph)	0	0	28	0	3	0	0	17	0	0	18	0
Lane Group Flow (vph)	67	628	115	45	461	0	107	158	0	24	119	0
Confl. Peds. (#/hr)			1		1							
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	29.1	29.1	29.1	29.1	29.1		14.8	14.8		14.8	14.8	
Effective Green, g (s)	32.1	32.1	32.1	32.1	32.1		16.8	16.8		16.8	16.8	
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56		0.30	0.30		0.30	0.30	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	350	883	537	231	737		243	347		164	337	
v/s Ratio Prot		c0.40			0.35			c0.13			0.10	
v/s Ratio Perm	0.11		0.12	0.11			0.13			0.04		
v/c Ratio	0.19	0.71	0.21	0.19	0.63		0.44	0.46		0.15	0.35	
Uniform Delay, d1	6.1	9.0	6.1	6.1	8.4		16.2	16.3		14.8	15.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	2.7	0.2	0.4	1.7		1.3	1.0		0.4	0.6	
Delay (s)	6.3	11.8	6.3	6.5	10.0		17.5	17.3		15.2	16.4	
Level of Service	A	B	A	A	B		B	B		B	B	
Approach Delay (s)		10.4			9.7			17.4			16.2	
Approach LOS		B			A			B			B	

Intersection Summary

HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	56.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Background - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	39	103	30	76	165	3	33	241	83	15	154	34
Future Volume (vph)	39	103	30	76	165	3	33	241	83	15	154	34
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.998			0.969			0.977	
Flt Protected		0.989			0.985			0.995			0.996	
Satd. Flow (prot)	0	1394	0	0	1437	0	0	1306	0	0	1187	0
Flt Permitted		0.989			0.985			0.995			0.996	
Satd. Flow (perm)	0	1394	0	0	1437	0	0	1306	0	0	1187	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2628.2			714.3	
Travel Time (s)		30.1			38.7			189.2			51.4	
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	42	112	33	83	179	3	36	262	90	16	167	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	187	0	0	265	0	0	388	0	0	220	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			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 66.8%

ICU Level of Service C

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Background - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	39	103	30	76	165	3	33	241	83	15	154	34
Future Volume (vph)	39	103	30	76	165	3	33	241	83	15	154	34
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)	42	112	33	83	179	3	36	262	90	16	167	37
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	187	265	388	220								
Volume Left (vph)	42	83	36	16								
Volume Right (vph)	33	3	90	37								
Hadj (s)	-0.01	0.08	0.04	0.28								
Departure Headway (s)	6.4	6.3	5.9	6.5								
Degree Utilization, x	0.33	0.46	0.64	0.39								
Capacity (veh/h)	486	521	580	498								
Control Delay (s)	12.6	14.7	18.6	13.6								
Approach Delay (s)	12.6	14.7	18.6	13.6								
Approach LOS	B	B	C	B								
Intersection Summary												
Delay		15.5										
Level of Service		C										
Intersection Capacity Utilization		66.8%										
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Background - 2030
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	87	541	414	94	222	165
Future Volume (vph)	87	541	414	94	222	165
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.975		0.942	
Flt Protected		0.993			0.972	
Satd. Flow (prot)	0	1128	1300	0	1230	0
Flt Permitted		0.993			0.972	
Satd. Flow (perm)	0	1128	1300	0	1230	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	95	588	450	102	241	179
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	683	552	0	420	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	127.9%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Background - 2030
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	87	541	414	94	222	165
Future Volume (veh/h)	87	541	414	94	222	165
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	588	450	102	241	179
Approach Volume (veh/h)		683	552		420	
Crossing Volume (veh/h)		241	95		450	
High Capacity (veh/h)		1147	1286		971	
High v/c (veh/h)		0.60	0.43		0.43	
Low Capacity (veh/h)		945	1071		788	
Low v/c (veh/h)		0.72	0.52		0.53	
Intersection Summary						
Maximum v/c High	0.60					
Maximum v/c Low	0.72					
Intersection Capacity Utilization	127.9%			ICU Level of Service H		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Background - 2030
AM Peak Hour

Intersection			
Intersection Delay, s/veh	12.2		
Intersection LOS	B		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	683	552	420
Demand Flow Rate, veh/h	738	574	464
Vehicles Circulating, veh/h	258	121	472
Vehicles Exiting, veh/h	678	875	223
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	15.1	8.1	12.8
Approach LOS	C	A	B
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	738	574	464
Cap Entry Lane, veh/h	1061	1220	853
Entry HV Adj Factor	0.925	0.961	0.905
Flow Entry, veh/h	683	552	420
Cap Entry, veh/h	981	1172	772
V/C Ratio	0.696	0.471	0.544
Control Delay, s/veh	15.1	8.1	12.8
LOS	C	A	B
95th %tile Queue, veh	6	3	3

Thorold Townline & Highway 20, Thorold
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Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821.26/11/2015]
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:32:04 PM

Summary of intersection performance

	AM						Intersection Delay (s)	Intersection LOS
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS			
	A1 - BG 2030							
Intersection 1 - Leg North	0.99	220.99	8.00	0.47	A	8.38	A	
Intersection 1 - Leg West	1.97	2.15	10.23	0.65	B			
Intersection 1 - Leg East	1.04	?	6.44	0.50	A			
Intersection 2 - Leg North	0.35	~1	2.84	0.24	A	2.75	A	
Intersection 2 - Leg West	0.57	1.08	2.95	0.35	A			
Intersection 2 - Leg East	0.39	~1	2.43	0.28	A			
Intersection 3 - Leg North	0.21	~1	3.13	0.17	A	3.48	A	
Intersection 3 - Leg West	0.80	1.08	4.12	0.43	A			
Intersection 3 - Leg East	0.39	~1	2.98	0.27	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:32:03 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - BG 2030, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
BG 2030, AM	BG 2030	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				8.38	A
2	2	Dual Lane	Roundabout	North,West,East				2.75	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				3.48	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width	E - Entry width	F - Effective flare length	R - Entry radius	D - Inscribed circle diameter	PHI - Conflict (entry) angle	Exit

		(m)	(m)	(m)	(m)	(m)	(deg)	Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	407.00	100.000
1	West	ONE HOUR	✓	638.00	100.000

1	East	ONE HOUR	✓	531.00	100.000
2	North	ONE HOUR	✓	407.00	100.000
2	West	ONE HOUR	✓	638.00	100.000
2	East	ONE HOUR	✓	531.00	100.000
3	North	ONE HOUR	✓	407.00	100.000
3	West	ONE HOUR	✓	638.00	100.000
3	East	ONE HOUR	✓	531.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
North	0.000	185.000	222.000	
West	87.000	0.000	551.000	
East	97.000	434.000	0.000	

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

From	To			
	North	West	East	
North	0.00	0.45	0.55	
West	0.14	0.00	0.86	
East	0.18	0.82	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.000	185.000	222.000	
West	87.000	0.000	551.000	
East	97.000	434.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.00	0.45	0.55	
West	0.14	0.00	0.86	
East	0.18	0.82	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.000	185.000	222.000	
West	87.000	0.000	551.000	
East	97.000	434.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.00	0.45	0.55	
West	0.14	0.00	0.86	
East	0.18	0.82	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 1 (for whole period)

From	To			
	North	West	East	
North	0.00	0.45	0.55	
West	0.14	0.00	0.86	
East	0.18	0.82	0.00	

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.47	8.00	0.99	220.99	A	373.47	560.21	62.17	6.66	0.69	62.17	6.66
1	West	0.65	10.23	1.97	2.15	B	585.44	878.16	115.66	7.90	1.29	115.66	7.90
1	East	0.50	6.44	1.04	?	A	487.25	730.88	67.74	5.56	0.75	67.75	5.56
2	North	0.24	2.84	0.35	~1	A	373.47	560.21	24.51	2.63	0.27	24.51	2.63
2	West	0.35	2.95	0.57	1.08	A	585.44	878.16	39.32	2.69	0.44	39.32	2.69
2	East	0.28	2.43	0.39	~1	A	487.25	730.88	27.88	2.29	0.31	27.88	2.29
3	North	0.17	3.13	0.21	~1	A	373.47	305.57	14.88	2.92	0.17	14.89	2.92
3	West	0.43	4.12	0.80	1.08	A	585.44	878.16	53.30	3.64	0.59	53.31	3.64
3	East	0.27	2.98	0.39	~1	A	487.25	597.37	27.85	2.80	0.31	27.85	2.80

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	306.41		76.60			304.56	137.71	325.02	0.00	1033.59	681.37	0.296	0.00	0.46	5.443	A
1	West	480.32		120.08			477.15	463.46	166.13	0.00	1125.55	1006.60	0.427	0.00	0.79	5.943	A
1	East	399.76		99.94			397.66	578.21	65.07	0.00	1184.04	1142.26	0.338	0.00	0.53	4.751	A
2	North	306.41		76.60			305.59	138.17	325.96	0.00	1957.06	1001.79	0.157	0.00	0.20	2.407	A
2	West	480.32		120.08			479.03	464.87	166.69	0.00	2072.20	1797.67	0.232	0.00	0.32	2.427	A
2	East	399.76		99.94			398.81	580.39	65.32	0.00	2145.49	2015.49	0.186	0.00	0.24	2.143	A
3	North	306.41	167.13	41.78	139.28	73.03	166.63	65.27	325.79	0.00	1583.15	620.24	0.106	0.00	0.13	2.719	A
3	West	480.32	480.32	120.08	0.00	139.28	478.63	325.79	166.63	0.00	1696.20	1374.01	0.283	0.00	0.42	3.175	A

3	East	399.76	326.74	81.68	73.03	0.00	325.79	579.99	65.27	0.00	1768.19	1681.47	0.185	0.00	0.24	2.619	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	365.88		91.47			365.19	165.09	389.58	0.00	996.23	681.37	0.367	0.46	0.63	6.297	A
1	West	573.55		143.39			572.16	555.57	199.20	0.00	1106.41	1006.60	0.519	0.79	1.14	7.227	A
1	East	477.36		119.34			476.65	693.33	78.02	0.00	1176.54	1142.26	0.406	0.53	0.70	5.346	A
2	North	365.88		91.47			365.66	165.32	389.96	0.00	1910.79	1001.79	0.191	0.20	0.26	2.574	A
2	West	573.55		143.39			573.18	556.17	199.45	0.00	2048.52	1797.67	0.280	0.32	0.42	2.624	A
2	East	477.36		119.34			477.11	694.47	78.16	0.00	2136.20	2015.49	0.223	0.24	0.30	2.257	A
3	North	365.88	199.57	49.89	166.31	87.20	199.44	78.14	389.91	0.00	1537.60	620.24	0.130	0.13	0.16	2.878	A
3	West	573.55	573.55	143.39	0.00	166.31	573.01	389.91	199.44	0.00	1672.89	1374.01	0.343	0.42	0.56	3.517	A
3	East	477.36	390.16	97.54	87.20	0.00	389.91	694.31	78.14	0.00	1759.05	1681.47	0.222	0.24	0.30	2.760	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	448.12		112.03			446.74	201.91	476.77	0.00	945.76	681.37	0.474	0.63	0.98	7.949	A
1	West	702.45		175.61			699.26	679.83	243.68	0.00	1080.67	1006.60	0.650	1.14	1.94	10.065	B
1	East	584.64		146.16			583.33	847.58	95.35	0.00	1166.51	1142.26	0.501	0.70	1.03	6.409	A
2	North	448.12		112.03			447.75	202.43	477.53	0.00	1847.48	1001.79	0.243	0.26	0.35	2.841	A
2	West	702.45		175.61			701.83	681.05	244.23	0.00	2016.15	1797.67	0.348	0.42	0.57	2.944	A
2	East	584.64		146.16			584.26	850.35	95.70	0.00	2123.52	2015.49	0.275	0.30	0.39	2.433	A
3	North	448.12	244.43	61.11	203.69	106.80	244.22	95.66	477.46	0.00	1475.42	620.24	0.166	0.16	0.21	3.128	A
3	West	702.45	702.45	175.61	0.00	203.69	701.49	477.46	244.22	0.00	1641.09	1374.01	0.428	0.56	0.80	4.116	A
3	East	584.64	477.84	119.46	106.80	0.00	477.46	850.05	95.66	0.00	1746.61	1681.47	0.274	0.30	0.39	2.978	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	448.12		112.03			448.08	202.57	477.82	0.00	945.16	681.37	0.474	0.98	0.99	8.001	A
1	West	702.45		175.61			702.33	681.49	244.41	0.00	1080.25	1006.60	0.650	1.94	1.97	10.234	B
1	East	584.64		146.16			584.61	850.97	95.77	0.00	1166.27	1142.26	0.501	1.03	1.04	6.439	A
2	North	448.12		112.03			448.11	202.59	477.84	0.00	1847.26	1001.79	0.243	0.35	0.35	2.842	A
2	West	702.45		175.61			702.45	681.53	244.42	0.00	2016.00	1797.67	0.348	0.57	0.57	2.946	A
2	East	584.64		146.16			584.64	851.08	95.79	0.00	2123.46	2015.49	0.275	0.39	0.39	2.433	A
3	North	448.12	244.43	61.11	203.69	106.80	244.42	95.79	477.84	0.00	1475.15	620.24	0.166	0.21	0.21	3.129	A
3	West	702.45	702.45	175.61	0.00	203.69	702.44	477.84	244.42	0.00	1640.94	1374.01	0.428	0.80	0.80	4.124	A
3	East	584.64	477.84	119.46	106.80	0.00	477.84	851.08	95.79	0.00	1746.52	1681.47	0.274	0.39	0.39	2.978	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	365.88		91.47			367.24	166.08	391.21	0.00	995.29	681.37	0.368	0.99	0.65	6.348	A
1	West	573.55		143.39			576.71	558.13	200.31	0.00	1105.77	1006.60	0.519	1.97	1.18	7.359	A
1	East	477.36		119.34			478.64	698.38	78.64	0.00	1176.19	1142.26	0.406	1.04	0.72	5.381	A
2	North	365.88		91.47			366.25	165.56	390.47	0.00	1910.42	1001.79	0.192	0.35	0.26	2.576	A
2	West	573.55		143.39			574.16	556.94	199.77	0.00	2048.29	1797.67	0.280	0.57	0.42	2.626	A
2	East	477.36		119.34			477.73	695.64	78.30	0.00	2136.11	2015.49	0.223	0.39	0.30	2.258	A
3	North	365.88	199.57	49.89	166.31	87.20	199.78	78.34	390.53	0.00	1537.16	620.24	0.130	0.21	0.16	2.880	A
3	West	573.55	573.55	143.39	0.00	166.31	574.50	390.53	199.78	0.00	1672.65	1374.01	0.343	0.80	0.56	3.530	A
3	East	477.36	390.16	97.54	87.20	0.00	390.53	695.94	78.34	0.00	1758.91	1681.47	0.222	0.39	0.30	2.762	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	306.41		76.60			307.13	138.86	327.34	0.00	1032.25	681.37	0.297	0.65	0.47	5.492	A
1	West	480.32		120.08			481.79	466.94	167.52	0.00	1124.74	1006.60	0.427	1.18	0.81	6.036	A
1	East	399.76		99.94			400.50	583.61	65.70	0.00	1183.68	1142.26	0.338	0.72	0.53	4.788	A
2	North	306.41		76.60			306.64	138.62	326.94	0.00	1066.35	1001.79	0.157	0.26	0.21	2.411	A
2	West	480.32		120.08			480.70	466.32	167.26	0.00	2071.79	1797.67	0.232	0.42	0.33	2.433	A
2	East	399.76		99.94			400.01	582.40	65.55	0.00	2145.32	2015.49	0.186	0.30	0.24	2.147	A
3	North	306.41	167.13	41.78	139.28	73.03	167.27	65.57	326.98	0.00	1582.30	620.24	0.106	0.16	0.13	2.724	A
3	West	480.32	480.32	120.08	0.00	139.28	480.87	326.98	167.27	0.00	1695.74	1374.01	0.283	0.56	0.43	3.189	A

3	East	399.76	326.74	81.68	73.03	0.00	326.98	582.56	65.57	0.00	1767.98	1681.47	0.185	0.30	0.24	2.623	A

Queueing Delay Results for each time segment**Queueing Delay results: (08:00-08:15)**

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.71	0.45	5.443	A	A
1	West	11.41	0.76	5.943	A	A
1	East	7.66	0.51	4.751	A	A
2	North	3.02	0.20	2.407	A	A
2	West	4.77	0.32	2.427	A	A
2	East	3.51	0.23	2.143	A	A
3	North	1.86	0.12	2.719	A	A
3	West	6.21	0.41	3.175	A	A
3	East	3.50	0.23	2.619	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.27	0.62	6.297	A	A
1	West	16.50	1.10	7.227	A	A
1	East	10.31	0.69	5.346	A	A
2	North	3.87	0.26	2.574	A	A
2	West	6.17	0.41	2.624	A	A
2	East	4.43	0.30	2.257	A	A
3	North	2.36	0.16	2.878	A	A
3	West	8.23	0.55	3.517	A	A
3	East	4.42	0.29	2.760	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	14.15	0.94	7.949	A	A
1	West	27.43	1.83	10.065	B	B
1	East	14.97	1.00	6.409	A	A
2	North	5.22	0.35	2.841	A	A
2	West	8.45	0.56	2.944	A	A
2	East	5.84	0.39	2.433	A	A
3	North	3.13	0.21	3.128	A	A
3	West	11.72	0.78	4.116	A	A
3	East	5.82	0.39	2.978	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	14.76	0.98	8.001	A	A
1	West	29.34	1.96	10.234	B	B
1	East	15.53	1.04	6.439	A	A
2	North	5.29	0.35	2.842	A	A
2	West	8.60	0.57	2.946	A	A
2	East	5.91	0.39	2.433	A	A
3	North	3.18	0.21	3.129	A	A
3	West	12.01	0.80	4.124	A	A
3	East	5.91	0.39	2.978	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	10.05	0.67	6.348	A	A
1	West	18.44	1.23	7.359	A	A
1	East	11.07	0.74	5.381	A	A
2	North	3.99	0.27	2.576	A	A
2	West	6.39	0.43	2.626	A	A
2	East	4.56	0.30	2.258	A	A
3	North	2.43	0.16	2.880	A	A
3	West	8.63	0.58	3.530	A	A
3	East	4.57	0.30	2.762	A	A

Queueing Delay results: (09:15-09:30)

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Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	7.23	0.48	5.492	A	A
1	West	12.54	0.84	6.036	A	A
1	East	8.20	0.55	4.788	A	A
2	North	3.12	0.21	2.411	A	A
2	West	4.94	0.33	2.433	A	A
2	East	3.62	0.24	2.147	A	A
3	North	1.92	0.13	2.724	A	A
3	West	6.51	0.43	3.189	A	A
3	East	3.63	0.24	2.623	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.46	-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
1	West	0.79	-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
1	East	0.53	-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
2	North	0.20	-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
2	West	0.32	-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
2	East	0.24	-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
3	North	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
3	West	0.42	-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
3	East	0.24	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.63	0.00	0.00	0.00	>199			N/A	N/A
1	West	1.14	0.00	0.00	1.08	2.15			N/A	N/A
1	East	0.70	-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
2	North	0.26	-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
2	West	0.42	-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
2	East	0.30	-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
3	North	0.16	-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
3	West	0.56	-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
3	East	0.30	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.98	-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
1	West	1.94	0.00	0.00	0.00	2.15			N/A	N/A
1	East	1.03	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.35	-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
2	West	0.57	-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
2	East	0.39	-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
3	North	0.21	-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
3	West	0.80	-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
3	East	0.39	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

1	North	0.99	0.00	0.00	0.00	1.10			N/A	N/A
1	West	1.97	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	1.04	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.35	-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
2	West	0.57	0.00	0.00	0.00	1.08			N/A	N/A
2	East	0.39	-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
3	North	0.21	-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
3	West	0.80	0.00	0.00	0.00	1.08			N/A	N/A
3	East	0.39	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.65	-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
1	West	1.18	0.00	0.00	1.08	2.15			N/A	N/A
1	East	0.72	-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
2	North	0.26	-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
2	West	0.42	-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
2	East	0.30	-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
3	North	0.16	-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
3	West	0.56	-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
3	East	0.30	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.47	-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
1	West	0.81	0.00	0.00	1.08	1.08			N/A	N/A
1	East	0.53	-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
2	North	0.21	-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
2	West	0.33	-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
2	East	0.24	-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
3	North	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
3	West	0.43	-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
3	East	0.24	-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

Queuing and Blocking Report

Background - 2030
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	26.6	111.7	60.6	30.1	66.4	39.6	45.9	26.6	37.2
Average Queue (m)	11.2	48.3	14.6	9.6	32.2	16.5	18.1	7.5	18.1
95th Queue (m)	21.3	84.8	42.1	22.8	56.0	33.2	36.0	21.3	34.0
Link Distance (m)	902.3			568.8			768.8		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		
Storage Blk Time (%)	23		1		1		9		3
Queuing Penalty (veh)	44		5		0		14		7

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	26.0	31.4	60.2	44.7
Average Queue (m)	13.8	13.5	27.8	19.7
95th Queue (m)	22.1	24.3	46.2	33.2
Link Distance (m)	408.4	523.0	2603.2	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	85.5	28.7	61.5
Average Queue (m)	25.7	9.5	21.3
95th Queue (m)	62.0	23.0	44.0
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 76

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	755	196	53	774	40	159	144	87	41	186	91
Future Volume (vph)	76	755	196	53	774	40	159	144	87	41	186	91
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.993			0.943			0.951	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1348	1597	1054	1401	1340	0	1299	1229	0	1299	1219	0
Flt Permitted	0.116			0.158			0.432			0.497		
Satd. Flow (perm)	165	1597	1054	233	1340	0	591	1229	0	680	1219	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			74		4			40			33	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			2628.2	
Travel Time (s)		67.4			41.9			56.4			189.2	
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	83	821	213	58	841	43	173	157	95	45	202	99
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	821	213	58	884	0	173	252	0	45	301	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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	
Detector 1 Queue (s)	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	
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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	46.5	46.5	46.5	46.5	46.5		27.7	27.7		27.7	27.7	
Actuated g/C Ratio	0.57	0.57	0.57	0.57	0.57		0.34	0.34		0.34	0.34	
v/c Ratio	0.89	0.91	0.34	0.44	1.16		0.87	0.57		0.20	0.70	
Control Delay	96.8	35.0	9.4	27.4	110.5		64.7	23.5		20.5	29.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	96.8	35.0	9.4	27.4	110.5		64.7	23.5		20.5	29.6	
LOS	F	D	A	C	F		E	C		C	C	
Approach Delay		34.7			105.4			40.3			28.5	
Approach LOS		C			F			D			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 82.2

Natural Cycle: 115

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 58.3

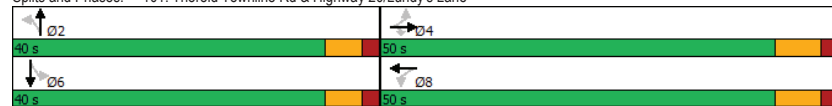
Intersection LOS: E

Intersection Capacity Utilization 121.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane



Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	83	821	213	58	884	173	252	45	301
v/c Ratio	0.89	0.91	0.34	0.44	1.16	0.87	0.57	0.20	0.70
Control Delay	96.8	35.0	9.4	27.4	110.5	64.7	23.5	20.5	29.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	96.8	35.0	9.4	27.4	110.5	64.7	23.5	20.5	29.6
Queue Length 50th (m)	12.0	121.8	11.6	5.6	~186.2	26.1	27.8	5.2	37.4
Queue Length 95th (m)	#45.1	#229.0	29.9	#24.3	#282.4	#61.5	50.7	13.1	65.7
Internal Link Dist (m)		912.7			557.5		759.0		2604.2
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	93	902	627	131	759	261	566	301	557
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.89	0.91	0.34	0.44	1.16	0.66	0.45	0.15	0.54

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.

HCM Signalized Intersection Capacity Analysis
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2030
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	755	196	53	774	40	159	144	87	41	186	91
Future Volume (vph)	76	755	196	53	774	40	159	144	87	41	186	91
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	1597	1054	1401	1340		1299	1230		1299	1218	
Flt Permitted	0.12	1.00	1.00	0.16	1.00		0.43	1.00		0.50	1.00	
Satd. Flow (perm)	165	1597	1054	233	1340		591	1230		679	1218	
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)	83	821	213	58	841	43	173	157	95	45	202	99
RTOR Reduction (vph)	0	0	32	0	2	0	0	27	0	0	22	0
Lane Group Flow (vph)	83	821	181	58	882	0	173	225	0	45	279	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	43.4	43.4	43.4	43.4	43.4		25.6	25.6		25.6	25.6	
Effective Green, g (s)	46.4	46.4	46.4	46.4	46.4		27.6	27.6		27.6	27.6	
Actuated g/C Ratio	0.57	0.57	0.57	0.57	0.57		0.34	0.34		0.34	0.34	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	93	903	596	131	758		198	414		228	409	
v/s Ratio Prot	0.51			c0.66			0.18			0.23		
v/s Ratio Perm	0.50			0.25			c0.29			0.07		
v/c Ratio	0.89	0.91	0.30	0.44	1.16		0.87	0.54		0.20	0.68	
Uniform Delay, d1	15.6	15.9	9.3	10.3	17.8		25.6	22.1		19.3	23.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	59.4	12.8	0.3	2.4	87.9		31.9	1.5		0.4	4.7	
Delay (s)	75.0	28.7	9.6	12.7	105.7		57.5	23.6		19.8	28.1	
Level of Service	E	C	A	B	F		E	C		B	C	
Approach Delay (s)	28.5			100.0			37.4			27.0		
Approach LOS	C			F			D			C		
Intersection Summary												
HCM 2000 Control Delay				53.4				HCM 2000 Level of Service				D
HCM 2000 Volume to Capacity ratio				1.05								
Actuated Cycle Length (s)				82.0				Sum of lost time (s)				8.0
Intersection Capacity Utilization				121.2%				ICU Level of Service				H
Analysis Period (min)				15								
c Critical Lane Group												

Lanes, Volumes, Timings
102: Thorold Townline Rd & Beaverdams Rd

Background - 2030
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	41	226	44	121	191	30	45	212	93	37	288	75
Future Volume (vph)	41	226	44	121	191	30	45	212	93	37	288	75
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
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
Flt Protected		0.981			0.988			0.964			0.975	
Satd. Flow (prot)	0	1428	0	0	1427	0	0	1343	0	0	1350	0
Flt Permitted		0.993			0.983			0.994			0.995	
Satd. Flow (perm)	0	1428	0	0	1427	0	0	1343	0	0	1350	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2628.2			714.3	
Travel Time (s)		30.1			38.7			189.2			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	45	246	48	132	208	33	49	230	101	40	313	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	339	0	0	373	0	0	380	0	0	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)		0.0			0.0			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop				Stop				Stop			
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	91.5%				ICU Level of Service F							
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
102: Thorold Townline Rd & Beaverdams Rd

Background - 2030
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	41	226	44	121	191	30	45	212	93	37	288	75
Future Volume (vph)	41	226	44	121	191	30	45	212	93	37	288	75
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)	45	246	48	132	208	33	49	230	101	40	313	82
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	339	373	380	435								
Volume Left (vph)	45	132	49	40								
Volume Right (vph)	48	33	101	82								
Hadj (s)	-0.04	0.03	-0.03	0.02								
Departure Headway (s)	9.3	9.2	9.1	9.2								
Degree Utilization, x	0.88	0.95	0.96	1.12								
Capacity (veh/h)	373	373	391	396								
Control Delay (s)	51.1	65.0	66.9	111.7								
Approach Delay (s)	51.1	65.0	66.9	111.7								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay	75.7											
Level of Service	F											
Intersection Capacity Utilization	91.5%			ICU Level of Service			F					
Analysis Period (min)	15											

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Background - 2030
PM Peak Hour

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	187	824	763	256	188	138
Future Volume (vph)	187	824	763	256	188	138
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.966		0.943		
Flt Protected		0.991		0.972		
Satd. Flow (prot)	0	1201	1302	0	1304	0
Flt Permitted		0.991		0.972		
Satd. Flow (perm)	0	1201	1302	0	1304	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	203	896	829	278	204	150
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1099	1107	0	354	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	193.6%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Background - 2030
PM Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	187	824	763	256	188	138
Future Volume (veh/h)	187	824	763	256	188	138
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	203	896	829	278	204	150
Approach Volume (veh/h)	1099	1107	354			
Crossing Volume (veh/h)	204	203	829			
High Capacity (veh/h)	1180	1181	716			
High v/c (veh/h)	0.93	0.94	0.49			
Low Capacity (veh/h)	976	977	563			
Low v/c (veh/h)	1.13	1.13	0.63			
Intersection Summary						
Maximum v/c High	0.94					
Maximum v/c Low	1.13					
Intersection Capacity Utilization	193.6%		ICU Level of Service		H	

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Background - 2030
PM Peak Hour

Intersection			
Intersection Delay, s/veh	45.0		
Intersection LOS	E		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1099	1107	354
Demand Flow Rate, veh/h	1114	1140	369
Vehicles Circulating, veh/h	204	209	854
Vehicles Exiting, veh/h	1019	1109	495
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	45.1	52.8	20.5
Approach LOS	E	F	C
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1114	1140	369
Cap Entry Lane, veh/h	1121	1115	578
Entry HV Adj Factor	0.987	0.971	0.959
Flow Entry, veh/h	1099	1107	354
Cap Entry, veh/h	1106	1083	554
V/C Ratio	0.994	1.022	0.639
Control Delay, s/veh	45.1	52.8	20.5
LOS	E	F	C
95th %tile Queue, veh	20	22	4

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:30:16 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
A1 - BG 2030							
Intersection 1 - Leg North	0.94	1.04	9.58	0.48	A	83.19	F
Intersection 1 - Leg West	31.84	91.22	98.02	1.03	F		
Intersection 1 - Leg East	29.43	88.58	91.76	1.02	F		
Intersection 2 - Leg North	0.30	~1	3.06	0.23	A	3.89	A
Intersection 2 - Leg West	1.25	1.01	3.99	0.55	A		
Intersection 2 - Leg East	1.26	1.03	4.05	0.55	A		
Intersection 3 - Leg North	0.21	~1	3.57	0.17	A	5.36	A
Intersection 3 - Leg West	2.10	3.04	6.78	0.68	A		
Intersection 3 - Leg East	1.05	?	4.51	0.51	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:30:15 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - BG 2030, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
BG 2030, PM	BG 2030	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				83.19	F
2	2	Dual Lane	Roundabout	North,West,East				3.89	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				5.36	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width	E - Entry width	F - Effective flare length	R - Entry radius	D - Inscribed circle diameter	PHI - Conflict (entry) angle	Exit

		(m)	(m)	(m)	(m)	(m)	(deg)	Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.351
3	West		(calculated)	(calculated)	0.710	1814.351
3	East		(calculated)	(calculated)	0.710	1814.351

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	326.00	100.000
1	West	ONE HOUR	✓	1026.00	100.000

1	East	ONE HOUR	✓	1024.00	100.000
2	North	ONE HOUR	✓	326.00	100.000
2	West	ONE HOUR	✓	1026.00	100.000
2	East	ONE HOUR	✓	1024.00	100.000
3	North	ONE HOUR	✓	326.00	100.000
3	West	ONE HOUR	✓	1026.00	100.000
3	East	ONE HOUR	✓	1024.00	100.000

Turning Proportions

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

From		To		
		North	West	East
From	North	0.000	138.000	188.000
	West	187.000	0.000	839.000
	East	256.000	768.000	0.000

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

From		To		
		North	West	East
From	North	0.00	0.42	0.58
	West	0.18	0.00	0.82
	East	0.25	0.75	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From		To		
		North	West	East
From	North	0.000	138.000	188.000
	West	187.000	0.000	839.000
	East	256.000	768.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

From		To		
		North	West	East
From	North	0.00	0.42	0.58
	West	0.18	0.00	0.82
	East	0.25	0.75	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From		To		
		North	West	East
From	North	0.000	138.000	188.000
	West	187.000	0.000	839.000
	East	256.000	768.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From		To		
		North	West	East
From	North	0.00	0.42	0.58
	West	0.18	0.00	0.82
	East	0.25	0.75	0.00

Vehicle Mix

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

From		To		
		North	West	East
From	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 1 (for whole period)

From		To		
		North	West	East

From		To		
		North	West	East
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
East		3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From		To		
		North	West	East
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
East		1.030	1.030	1.000

Truck Percentages - Intersection 2 (for whole period)

From		To		
		North	West	East
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
East		3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From		To		
		North	West	East
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
East		1.030	1.030	1.000

Truck Percentages - Intersection 3 (for whole period)

From		To		
		North	West	East
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
East		3.0	3.0	0.0

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.48	9.58	0.94	1.04	A	299.14	448.71	57.19	7.65	0.64	57.19	7.65
1	West	1.03	98.02	31.84	91.22	F	941.48	1412.21	936.44	39.79	10.40	936.56	39.79
1	East	1.02	91.76	29.43	88.58	F	939.64	1409.46	887.97	37.80	9.87	888.10	37.81
2	North	0.23	3.06	0.30	~1	A	299.14	448.71	20.59	2.75	0.23	20.59	2.75
2	West	0.55	3.99	1.25	1.01	A	941.48	1412.21	79.07	3.36	0.88	79.07	3.36
2	East	0.55	4.05	1.26	1.03	A	939.64	1409.46	79.98	3.40	0.89	79.99	3.41
3	North	0.17	3.57	0.21	~1	A	299.14	258.77	13.84	3.21	0.15	13.84	3.21
3	West	0.68	6.78	2.10	3.04	A	941.48	1412.21	122.53	5.21	1.36	122.54	5.21
3	East	0.51	4.51	1.05	?	A	939.64	1057.10	68.03	3.86	0.76	68.04	3.86

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	245.43		61.36			243.86	329.94	571.96	0.00	890.67	736.09	0.276	0.00	0.39	5.774	A
1	West	772.43		193.11			764.19	675.19	140.63	0.00	1140.31	976.02	0.677	0.00	2.06	9.505	A
1	East	770.92		192.73			762.62	765.54	139.28	0.00	1141.09	1118.74	0.676	0.00	2.08	9.599	A
2	North	245.43		61.36			244.76	332.48	576.40	0.00	1776.01	1126.89	0.138	0.00	0.17	2.443	A
2	West	772.43		193.11			770.06	680.01	141.15	0.00	2090.66	1722.89	0.369	0.00	0.59	2.758	A
2	East	770.92		192.73			768.53	770.86	140.35	0.00	2091.24	1965.69	0.369	0.00	0.60	2.799	A
3	North	245.43	141.54	35.38	103.89	192.73	141.09	140.18	576.11	0.00	1405.35	650.11	0.101	0.00	0.11	2.847	A
3	West	772.43	772.43	193.11	0.00	103.89	769.13	576.11	141.09	0.00	1714.34	1352.79	0.451	0.00	0.82	3.847	A

3	East	770.92	578.19	144.55	192.73	0.00	576.11	770.04	140.18	0.00	1714.98	1639.42	0.337	0.00	0.52	3.250	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	293.07		73.27			292.37	394.53	693.99	0.00	825.94	736.09	0.355	0.39	0.57	7.010	A
1	West	922.35		230.59			913.72	807.75	168.61	0.00	1124.12	976.02	0.821	2.06	4.22	16.675	C
1	East	920.55		230.14			911.56	915.80	166.54	0.00	1125.32	1118.74	0.818	2.08	4.22	16.723	C
2	North	293.07		73.27			292.87	397.87	689.76	0.00	1694.05	1126.89	0.173	0.17	0.22	2.671	A
2	West	922.35		230.59			921.48	813.73	168.89	0.00	2070.61	1722.89	0.445	0.59	0.81	3.174	A
2	East	920.55		230.14			919.67	922.42	167.95	0.00	2071.29	1965.69	0.444	0.60	0.82	3.219	A
3	North	293.07	169.01	42.25	124.06	230.14	168.87	167.84	689.69	0.00	1324.68	650.11	0.128	0.11	0.15	3.114	A
3	West	922.35	922.35	230.59	0.00	124.06	920.86	689.69	168.87	0.00	1694.60	1352.79	0.544	0.82	1.20	4.708	A
3	East	920.55	690.42	172.60	230.14	0.00	689.69	921.90	167.84	0.00	1695.34	1639.42	0.407	0.52	0.70	3.686	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	358.93		89.73			357.53	460.18	799.39	0.00	759.04	736.09	0.473	0.57	0.92	9.295	A
1	West	1129.65		282.41			1062.82	950.74	206.18	0.00	1102.37	976.02	1.025	4.22	20.92	55.201	F
1	East	1127.45		281.86			1065.86	1075.30	193.71	0.00	1109.59	1118.74	1.016	4.22	19.61	52.775	F
2	North	358.93		89.73			358.58	487.00	844.28	0.00	1582.34	1126.89	0.227	0.22	0.30	3.059	A
2	West	1129.65		282.41			1127.92	996.07	206.79	0.00	2043.21	1722.89	0.553	0.81	1.24	3.979	A
2	East	1127.45		281.86			1125.70	1129.13	205.58	0.00	2044.09	1965.69	0.552	0.82	1.25	4.030	A
3	North	358.93	206.99	51.75	151.94	281.86	206.76	205.25	844.20	0.00	1214.93	650.10	0.170	0.15	0.20	3.570	A
3	West	1129.65	1129.65	282.41	0.00	151.94	1129.55	845.56	206.99	0.00	1667.53	1352.79	0.677	1.20	2.08	6.693	A
3	East	1127.45	845.58	211.40	281.86	0.00	844.20	1127.62	205.25	0.00	1668.77	1639.42	0.507	0.70	1.05	4.490	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	358.93		89.73			358.82	469.98	816.14	0.00	749.35	736.09	0.479	0.92	0.94	9.582	A
1	West	1129.65		282.41			1085.96	968.04	206.93	0.00	1101.94	976.02	1.025	20.92	31.84	98.025	F
1	East	1127.45		281.86			1088.19	1094.96	197.93	0.00	1107.15	1118.74	1.018	19.61	29.43	91.764	F
2	North	358.93		89.73			358.93	487.74	845.56	0.00	1581.41	1126.89	0.227	0.30	0.30	3.062	A
2	West	1129.65		282.41			1129.62	997.50	206.99	0.00	2043.07	1722.89	0.553	1.24	1.25	3.994	A
2	East	1127.45		281.86			1127.42	1130.73	205.89	0.00	2043.86	1965.69	0.552	1.25	1.26	4.045	A
3	North	358.93	206.99	51.75	151.94	281.86	206.99	205.87	845.56	0.00	1213.97	650.10	0.171	0.20	0.21	3.574	A
3	West	1129.65	1129.65	282.41	0.00	151.94	1129.55	845.56	206.99	0.00	1667.53	1352.79	0.677	2.08	2.10	6.780	A
3	East	1127.45	845.58	211.40	281.86	0.00	845.56	1130.67	205.87	0.00	1668.32	1639.42	0.507	1.05	1.05	4.506	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	293.07		73.27			294.31	441.13	761.34	0.00	781.06	736.09	0.375	0.94	0.63	7.711	A
1	West	922.35		230.59			1027.90	885.93	169.72	0.00	1123.47	976.02	0.821	31.84	5.46	52.546	F
1	East	920.55		230.14			1015.13	1010.28	187.35	0.00	1113.27	1118.74	0.827	29.43	5.79	50.356	F
2	North	293.07		73.27			293.41	398.99	691.71	0.00	1692.64	1126.89	0.173	0.30	0.22	2.678	A
2	West	922.35		230.59			924.06	815.92	169.21	0.00	2070.38	1722.89	0.446	1.25	0.82	3.187	A
2	East	920.55		230.14			922.28	924.85	168.42	0.00	2070.95	1965.69	0.445	1.26	0.83	3.234	A
3	North	293.07	169.01	42.25	124.06	230.14	169.24	168.75	691.78	0.00	1323.20	650.11	0.128	0.21	0.15	3.122	A
3	West	922.35	922.35	230.59	0.00	124.06	925.87	691.78	169.24	0.00	1694.34	1352.79	0.544	2.10	1.22	4.771	A
3	East	920.55	690.42	172.60	230.14	0.00	691.78	926.36	168.75	0.00	1694.69	1639.42	0.407	1.05	0.71	3.701	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	245.43		61.36			246.34	339.44	588.85	0.00	880.90	736.09	0.279	0.63	0.41	5.908	A
	West	772.43		193.11			683.13	142.06	0.00	0.00	1139.48	976.02	0.678	0.79	0.46	11.662	B
	East	770.92		193.11			785.14	784.35	143.16	0.00	1139.85	1118.74	0.977	0.79	2.23	10.877	A
	South	245.43	61.36		245.63	333.90	58.18	0.00	1774.22	126.89	0.00	13.88	0.22	0.17	2.451	A	
	West	772.43		193.11			773.32	682.85	141.65	0.00	2090.30	1722.89	0.370	0.82	0.60	2.771	A
	East	770.92		193.11			771.82	774.03	140.95	0.00	2090.81	1965.69	0.369	0.83	0.60	2.814	A
3	North	245.43	141.54	25.38	103.89	192.73	141.67	141.07	578.93	0.00	1403.35	650.11	0.101	0.15	0.15	0.833	A
	West	772.43	772.43	193.11	0.00	103.89	778.93	141.67	0.00	1713.92	1352.79	0.451	1.22	0.84	3.889	A	

3	East	770.92	578.19	144.55	192.73	0.00	578.93	774.58	141.07	0.00	1714.36	1639.42	0.337	0.71	0.53	3.269	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	5.69	0.38	5.774	A	A
1	West	28.55	1.90	9.505	A	A
1	East	28.77	1.92	9.599	A	A
2	North	2.46	0.16	2.443	A	A
2	West	8.69	0.58	2.758	A	A
2	East	8.79	0.59	2.799	A	A
3	North	1.65	0.11	2.847	A	A
3	West	12.02	0.80	3.847	A	A
3	East	7.64	0.51	3.250	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	8.24	0.55	7.010	A	A
1	West	56.30	3.75	16.675	C	B
1	East	56.38	3.76	16.723	C	B
2	North	3.21	0.21	2.671	A	A
2	West	11.92	0.79	3.174	A	A
2	East	12.06	0.80	3.219	A	A
3	North	2.16	0.14	3.114	A	A
3	West	17.46	1.16	4.708	A	A
3	East	10.35	0.69	3.686	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	13.16	0.88	9.295	A	A
1	West	207.18	13.81	55.201	F	E
1	East	197.65	13.18	52.775	F	D
2	North	4.49	0.30	3.059	A	A
2	West	18.13	1.21	3.979	A	A
2	East	18.33	1.22	4.030	A	A
3	North	3.02	0.20	3.570	A	A
3	West	29.74	1.98	6.693	A	A
3	East	15.31	1.02	4.490	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	14.01	0.93	9.582	A	A
1	West	398.29	26.55	98.025	F	F
1	East	370.57	24.70	91.764	F	F
2	North	4.56	0.30	3.062	A	A
2	West	18.67	1.24	3.994	A	A
2	East	18.88	1.26	4.045	A	A
3	North	3.07	0.20	3.574	A	A
3	West	31.43	2.10	6.780	A	A
3	East	15.77	1.05	4.506	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.83	0.66	7.711	A	A
1	West	209.73	13.98	52.546	F	D
1	East	197.51	13.17	50.356	F	D
2	North	3.32	0.22	2.678	A	A
2	West	12.56	0.84	3.187	A	A
2	East	12.71	0.85	3.234	A	A
3	North	2.24	0.15	3.122	A	A
3	West	19.01	1.27	4.771	A	A
3	East	10.93	0.73	3.701	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.25	0.42	5.908	A	A
1	West	36.39	2.43	10.662	B	B
1	East	37.10	2.47	10.877	B	B
2	North	2.54	0.17	2.451	A	A
2	West	9.10	0.61	2.771	A	A
2	East	9.22	0.61	2.814	A	A
3	North	1.71	0.11	2.853	A	A
3	West	12.87	0.86	3.889	A	A
3	East	8.04	0.54	3.269	A	A

Queue Variation Results for each time segment

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.39	-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
1	West	2.06	0.00	1.01	3.04	3.04			N/A	N/A
1	East	2.08	0.00	1.03	3.09	3.09			N/A	N/A
2	North	0.17	-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
2	West	0.59	-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
2	East	0.60	-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
3	North	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
3	West	0.82	-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
3	East	0.52	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.57	-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
1	West	4.22	0.00	0.00	10.14	15.20			N/A	N/A
1	East	4.22	0.00	0.00	10.30	14.42			N/A	N/A
2	North	0.22	-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
2	West	0.81	0.00	0.00	0.00	1.01			N/A	N/A
2	East	0.82	0.00	0.00	0.00	1.03			N/A	N/A
3	North	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
3	West	1.20	0.00	0.00	2.03	3.04			N/A	N/A
3	East	0.70	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.92	-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
1	West	20.92	1.01	14.19	45.61	58.79			N/A	N/A
1	East	19.61	0.00	12.36	44.29	57.68			N/A	N/A
2	North	0.30	-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
2	West	1.24	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.25	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.20	-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
3	West	2.08	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.05	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.94	0.00	0.00	0.00	1.04			N/A	N/A
1	West	31.84	1.01	22.30	70.95	91.22			N/A	N/A
1	East	29.43	0.00	18.54	67.98	88.58			N/A	N/A
							Percentiles could not be calculated. This may be			

2	North	0.30	~1	~1	~1	~1	because the mean queue is very small or very big.		N/A	N/A
2	West	1.25	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.26	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.21	~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
3	West	2.10	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.05	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.63	~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
1	West	5.46	0.00	0.00	12.16	21.29			N/A	N/A
1	East	5.79	0.00	0.00	13.39	21.63			N/A	N/A
2	North	0.22	~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
2	West	0.82	~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
2	East	0.83	~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
3	North	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
3	West	1.22	0.00	0.00	1.01	2.03			N/A	N/A
3	East	0.71	~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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.41	~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
1	West	2.20	0.00	0.00	1.01	6.08			N/A	N/A
1	East	2.23	0.00	0.00	1.03	6.18			N/A	N/A
2	North	0.17	~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
2	West	0.60	~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
2	East	0.60	~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
3	North	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
3	West	0.84	0.00	0.00	1.01	1.01			N/A	N/A
3	East	0.53	~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

Queuing and Blocking Report

Background - 2030
PM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	118.1	222.3	70.0	134.9	583.0	65.1	115.7	42.8	82.1
Average Queue (m)	44.4	113.2	45.7	70.2	479.2	37.8	41.4	9.3	39.4
95th Queue (m)	105.6	218.8	89.6	172.8	724.0	64.2	93.6	25.6	68.1
Link Distance (m)	902.3				568.8	768.8		2603.2	
Upstream Blk Time (%)	54								
Queuing Penalty (veh)	0								
Storage Bay Dist (m)	90.0	20.0		55.0	20.0		20.0		
Storage Blk Time (%)	42		4	57		52	18	2	31
Queuing Penalty (veh)	114		36	30		121	29	6	13

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	66.4	55.1	67.7	128.5
Average Queue (m)	26.1	24.5	35.0	49.5
95th Queue (m)	50.1	47.6	58.6	108.0
Link Distance (m)	408.4	523.0	2603.2	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	960.5	696.1	41.7
Average Queue (m)	576.0	392.9	17.4
95th Queue (m)	1084.6	824.7	32.5
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)	10		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 349

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PTSL (210565)SimTraffic Report
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Appendix F2

2035 Background Operations Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖	↖	↖		↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	66	615	144	46	424	34	107	131	47	23	101	36
Future Volume (vph)	66	615	144	46	424	34	107	131	47	23	101	36
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0			0.0	20.0		0.0	20.0	0.0
Storage Lanes	1		1	1			0	1		0	1	0
Taper Length (m)	100.0			80.0				50.0			50.0	
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			0.98	1.00								
Frt			0.850		0.989			0.960			0.961	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	1566	973	1287	1307	0	1171	1176	0	836	1144	0
Flt Permitted	0.398			0.276			0.662			0.596		
Satd. Flow (perm)	581	1566	952	374	1307	0	816	1176	0	524	1144	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67		7			24			24	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			2628.2	
Travel Time (s)		67.4			41.9			56.4			189.2	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	72	668	157	50	461	37	116	142	51	25	110	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	72	668	157	50	498	0	116	193	0	25	149	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

Thorold Townline & Highway 20, Thorold
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Lanes, Volumes, Timings

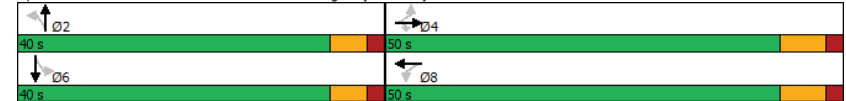
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	35.0	35.0	35.0	35.0	35.0		18.2	18.2		18.2	18.2	
Actuated g/C Ratio	0.57	0.57	0.57	0.57	0.57		0.30	0.30		0.30	0.30	
v/c Ratio	0.22	0.75	0.28	0.24	0.67		0.48	0.53		0.16	0.42	
Control Delay	9.5	17.3	6.1	11.1	15.2		28.0	23.7		21.8	20.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.5	17.3	6.1	11.1	15.2		28.0	23.7		21.8	20.9	
LOS	A	B	A	B	B		C	C		C	C	
Approach Delay		14.7			14.9			25.3			21.0	
Approach LOS		B			B			C			C	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 61.6												
Natural Cycle: 85												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.75												
Intersection Signal Delay: 17.0	Intersection LOS: B											
Intersection Capacity Utilization 89.4%	ICU Level of Service E											
Analysis Period (min) 15												

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035

AM Peak Hour

	↖	→	↗	↙	←	↘	↑	↖	↓
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	72	668	157	50	498	116	193	25	149
v/c Ratio	0.22	0.75	0.28	0.24	0.67	0.48	0.53	0.16	0.42
Control Delay	9.5	17.3	6.1	11.1	15.2	28.0	23.7	21.8	20.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.5	17.3	6.1	11.1	15.2	28.0	23.7	21.8	20.9
Queue Length 50th (m)	3.6	50.6	4.3	2.5	34.2	11.0	16.0	2.1	11.4
Queue Length 95th (m)	13.2	123.9	16.8	10.8	88.6	30.4	41.3	8.9	31.1
Internal Link Dist (m)		912.7			557.5		759.0		2604.2
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	450	1215	753	290	1015	504	736	324	716
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.55	0.21	0.17	0.49	0.23	0.26	0.08	0.21
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	615	144	46	424	34	107	131	47	23	101	36
Future Volume (vph)	66	615	144	46	424	34	107	131	47	23	101	36
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	1566	952	1287	1307		1171	1177		836	1143	
Flt Permitted	0.40	1.00	1.00	0.28	1.00		0.66	1.00		0.60	1.00	
Satd. Flow (perm)	582	1566	952	374	1307		816	1177		524	1143	
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)	72	668	157	50	461	37	116	142	51	25	110	39
RTOR Reduction (vph)	0	0	29	0	3	0	0	17	0	0	17	0
Lane Group Flow (vph)	72	668	128	50	495	0	116	176	0	25	132	0
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	31.8	31.8	31.8	31.8	31.8		16.1	16.1		16.1	16.1	
Effective Green, g (s)	34.8	34.8	34.8	34.8	34.8		18.1	18.1		18.1	18.1	
Actuated g/C Ratio	0.57	0.57	0.57	0.57	0.57		0.30	0.30		0.30	0.30	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	332	894	544	213	746		242	349		155	339	
v/s Ratio Prot		c0.43			0.38			c0.15			0.12	
v/s Ratio Perm	0.12		0.13	0.13			0.14			0.05		
v/c Ratio	0.22	0.75	0.24	0.23	0.66		0.48	0.50		0.16	0.39	
Uniform Delay, d1	6.4	9.8	6.5	6.5	9.0		17.5	17.7		15.8	17.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	3.4	0.2	0.6	2.2		1.5	1.2		0.5	0.7	
Delay (s)	6.7	13.2	6.7	7.0	11.2		19.0	18.8		16.3	17.8	
Level of Service	A	B	A	A	B		B	B		B	B	
Approach Delay (s)		11.5			10.9			18.9			17.5	
Approach LOS		B			B			B			B	
Intersection Summary												
HCM 2000 Control Delay			13.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			60.9				Sum of lost time (s)			8.0		
Intersection Capacity Utilization			89.4%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
102: Thorold Townline Rd & Beaverdams Rd

Background - 2035
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	43	112	33	80	182	4	37	257	83	16	165	38
Future Volume (vph)	43	112	33	80	182	4	37	257	83	16	165	38
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.998			0.970			0.977	
Flt Protected		0.989			0.985			0.995			0.996	
Satd. Flow (prot)	0	1394	0	0	1436	0	0	1307	0	0	1188	0
Flt Permitted		0.989			0.985			0.995			0.996	
Satd. Flow (perm)	0	1394	0	0	1436	0	0	1307	0	0	1188	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2628.2			714.3	
Travel Time (s)		30.1			38.7			189.2			51.4	
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	47	122	36	87	198	4	40	279	90	17	179	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	205	0	0	289	0	0	409	0	0	237	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			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 71.3%
Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
102: Thorold Townline Rd & Beaverdams Rd

Background - 2035
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	43	112	33	80	182	4	37	257	83	16	165	38
Future Volume (vph)	43	112	33	80	182	4	37	257	83	16	165	38
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)	47	122	36	87	198	4	40	279	90	17	179	41
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	205	289	409	237								
Volume Left (vph)	47	87	40	17								
Volume Right (vph)	36	4	90	41								
Hadj (s)	-0.01	0.08	0.05	0.28								
Departure Headway (s)	6.8	6.6	6.2	6.8								
Degree Utilization, x	0.39	0.53	0.71	0.45								
Capacity (veh/h)	459	489	551	471								
Control Delay (s)	13.9	16.9	22.7	15.2								
Approach Delay (s)	13.9	16.9	22.7	15.2								
Approach LOS	B	C	C	C								
Intersection Summary												
Delay		18.1										
Level of Service		C										
Intersection Capacity Utilization		71.3%		ICU Level of Service					C			
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Background - 2035
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	91	589	450	97	226	169
Future Volume (vph)	91	589	450	97	226	169
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.976		0.942	
Flt Protected		0.993			0.972	
Satd. Flow (prot)	0	1130	1301	0	1230	0
Flt Permitted		0.993			0.972	
Satd. Flow (perm)	0	1130	1301	0	1230	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	99	640	489	105	246	184
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	739	594	0	430	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	135.6%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Background - 2035
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	91	589	450	97	226	169
Future Volume (veh/h)	91	589	450	97	226	169
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	640	489	105	246	184
Approach Volume (veh/h)		739	594		430	
Crossing Volume (veh/h)		246	99		489	
High Capacity (veh/h)		1142	1282		942	
High v/c (veh/h)		0.65	0.46		0.46	
Low Capacity (veh/h)		941	1068		762	
Low v/c (veh/h)		0.79	0.56		0.56	
Intersection Summary						
Maximum v/c High	0.65					
Maximum v/c Low	0.79					
Intersection Capacity Utilization	135.6%			ICU Level of Service H		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Background - 2035
AM Peak Hour

Intersection			
Intersection Delay, s/veh	14.0		
Intersection LOS	B		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	739	594	430
Demand Flow Rate, veh/h	798	618	475
Vehicles Circulating, veh/h	263	126	513
Vehicles Exiting, veh/h	725	935	231
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	17.9	8.8	14.3
Approach LOS	C	A	B
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	798	618	475
Cap Entry Lane, veh/h	1055	1213	818
Entry HV Adj Factor	0.926	0.960	0.905
Flow Entry, veh/h	739	594	430
Cap Entry, veh/h	977	1165	740
V/C Ratio	0.756	0.509	0.581
Control Delay, s/veh	17.9	8.8	14.3
LOS	C	A	B
95th %tile Queue, veh	7	3	4

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
Page 9

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821.26/11/2015]
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:29:52 PM

Summary of intersection performance

	AM						Intersection Delay (s)	Intersection LOS
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS			
A1 - BG 2035								
Intersection 1 - Leg North	0.98	1.10	8.14	0.47	A	9.40	A	
Intersection 1 - Leg West	2.51	5.37	12.14	0.70	B			
Intersection 1 - Leg East	1.19	?	6.95	0.54	A			
Intersection 2 - Leg North	0.35	~1	2.87	0.24	A	2.83	A	
Intersection 2 - Leg West	0.65	1.07	3.09	0.38	A			
Intersection 2 - Leg East	0.43	~1	2.50	0.29	A			
Intersection 3 - Leg North	0.22	~1	3.21	0.17	A	3.67	A	
Intersection 3 - Leg West	0.93	~1	4.40	0.46	A			
Intersection 3 - Leg East	0.44	~1	3.08	0.30	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM " model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:29:51 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - BG 2035, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
BG 2035, AM	BG 2035	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				9.40	A
2	2	Dual Lane	Roundabout	North,West,East				2.83	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				3.67	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width	E - Entry width	F - Effective flare length	R - Entry radius	D - Inscribed circle diameter	PHI - Conflict (entry) angle	Exit

		(m)	(m)	(m)	(m)	(m)	(deg)	Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	395.00	100.000
1	West	ONE HOUR	✓	690.00	100.000

1	East	ONE HOUR	✓	567.00	100.000
2	North	ONE HOUR	✓	395.00	100.000
2	West	ONE HOUR	✓	690.00	100.000
2	East	ONE HOUR	✓	567.00	100.000
3	North	ONE HOUR	✓	395.00	100.000
3	West	ONE HOUR	✓	690.00	100.000
3	East	ONE HOUR	✓	567.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
North	0.000	169.000	226.000	
West	91.000	0.000	599.000	
East	97.000	470.000	0.000	

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

From	To			
	North	West	East	
North	0.00	0.43	0.57	
West	0.13	0.00	0.87	
East	0.17	0.83	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.000	169.000	226.000	
West	91.000	0.000	599.000	
East	97.000	470.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.00	0.43	0.57	
West	0.13	0.00	0.87	
East	0.17	0.83	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.000	169.000	226.000	
West	91.000	0.000	599.000	
East	97.000	470.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.00	0.43	0.57	
West	0.13	0.00	0.87	
East	0.17	0.83	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 1 (for whole period)

To			

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.47	8.14	0.98	1.10	A	362.46	543.69	61.12	6.75	0.68	61.13	6.75
1	West	0.70	12.14	2.51	5.37	B	633.16	949.73	140.93	8.90	1.57	140.95	8.90
1	East	0.54	6.95	1.19	?	A	520.29	780.43	76.63	5.89	0.85	76.64	5.89
2	North	0.24	2.87	0.35	~1	A	362.46	543.69	23.95	2.64	0.27	23.96	2.64
2	West	0.38	3.09	0.65	1.07	A	633.16	949.73	44.11	2.79	0.49	44.12	2.79
2	East	0.29	2.50	0.43	~1	A	520.29	780.43	30.47	2.34	0.34	30.47	2.34
3	North	0.17	3.21	0.22	~1	A	362.46	311.07	15.49	2.99	0.17	15.49	2.99
3	West	0.46	4.40	0.93	~1	A	633.16	949.73	60.65	3.83	0.67	60.65	3.83
3	East	0.30	3.08	0.44	~1	A	520.29	646.92	31.01	2.88	0.34	31.01	2.88

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	297.38		74.34			295.57	140.66	351.91	0.00	1018.03	672.18	0.292	0.00	0.45	5.482	A
1	West	519.47		129.87			515.82	478.37	169.11	0.00	1123.83	999.12	0.462	0.00	0.91	6.325	A
1	East	426.87		106.72			424.53	616.91	68.03	0.00	1182.33	1145.44	0.361	0.00	0.58	4.931	A
2	North	297.38		74.34			296.58	141.17	352.98	0.00	1937.52	980.79	0.153	0.00	0.20	2.418	A
2	West	519.47		129.87			518.03	479.88	169.69	0.00	2070.03	1787.02	0.251	0.00	0.36	2.490	A
2	East	426.87		106.72			425.83	619.40	68.32	0.00	2143.32	2022.33	0.199	0.00	0.26	2.181	A
3	North	297.38	170.14	42.54	127.23	73.03	169.62	68.26	352.79	0.00	1563.97	617.27	0.109	0.00	0.13	2.763	A
3	West	519.47	519.47	129.87	0.00	127.23	517.58	352.79	169.62	0.00	1694.07	1376.11	0.307	0.00	0.47	3.282	A

3	East	426.87	353.84	88.46	73.03	0.00	352.79	618.94	68.26	0.00	1766.07	1685.64	0.200	0.00	0.26	2.673	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	355.10		88.77			354.41	168.64	421.84	0.00	977.56	672.18	0.363	0.45	0.62	6.364	A
1	West	620.30		155.07			618.54	573.47	202.78	0.00	1104.34	999.12	0.562	0.91	1.35	7.933	A
1	East	509.72		127.43			509.90	739.74	81.58	0.00	1174.49	1145.44	0.434	0.58	0.79	5.624	A
2	North	355.10		88.77			354.88	168.91	422.30	0.00	1887.41	980.79	0.188	0.20	0.25	2.590	A
2	West	620.30		155.07			619.87	574.13	203.04	0.00	2045.92	1787.02	0.303	0.36	0.47	2.712	A
2	East	509.72		127.43			509.45	741.16	81.75	0.00	2133.61	2022.33	0.239	0.26	0.33	2.307	A
3	North	355.10	203.17	50.79	151.93	87.20	203.03	81.72	422.24	0.00	1514.64	617.27	0.134	0.13	0.17	2.936	A
3	West	620.30	620.30	155.07	0.00	151.93	619.66	422.24	203.03	0.00	1670.34	1376.11	0.371	0.47	0.63	3.680	A
3	East	509.72	422.52	105.63	87.20	0.00	422.24	740.97	81.72	0.00	1756.50	1685.64	0.241	0.26	0.33	2.833	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	434.90		108.73			433.53	206.14	516.17	0.00	922.96	672.18	0.471	0.62	0.97	8.088	A
1	West	759.70		189.93			755.28	701.65	248.04	0.00	1078.14	999.12	0.705	1.35	2.46	11.817	B
1	East	624.28		156.07			622.70	903.71	99.61	0.00	1164.05	1145.44	0.536	0.79	1.19	6.902	A
2	North	434.90		108.73			434.54	206.82	517.12	0.00	1818.86	980.79	0.239	0.25	0.35	2.868	A
2	West	759.70		189.93			758.97	703.04	248.62	0.00	2012.97	1787.02	0.377	0.47	0.65	3.083	A
2	East	624.28		156.07			623.85	907.50	100.10	0.00	2120.35	2022.33	0.294	0.33	0.43	2.504	A
3	North	434.90	248.83	62.21	186.07	106.80	248.61	100.04	517.04	0.00	1447.31	617.27	0.172	0.17	0.22	3.213	A
3	West	759.70	759.70	189.93	0.00	186.07	758.54	517.04	248.61	0.00	1637.97	1376.11	0.464	0.63	0.92	4.393	A
3	East	624.28	517.48	129.37	106.80	0.00	517.04	907.11	100.04	0.00	1743.49	1685.64	0.297	0.33	0.44	3.082	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	434.90		108.73			434.87	206.96	517.45	0.00	922.22	672.18	0.472	0.97	0.98	8.145	A
1	West	759.70		189.93			759.49	703.50	248.81	0.00	1077.70	999.12	0.705	2.46	2.51	12.135	B
1	East	624.28		156.07			624.24	908.14	100.17	0.00	1163.73	1145.44	0.536	1.19	1.19	6.946	A
2	North	434.90		108.73			434.90	206.99	517.48	0.00	1818.60	980.79	0.239	0.35	0.35	2.868	A
2	West	759.70		189.93			759.70	703.55	248.83	0.00	2012.82	1787.02	0.377	0.65	0.65	3.086	A
2	East	624.28		156.07			624.28	908.33	100.19	0.00	2120.28	2022.33	0.294	0.43	0.43	2.504	A
3	North	434.90	248.83	62.21	186.07	106.80	248.83	100.19	517.48	0.00	1447.00	617.27	0.172	0.22	0.22	3.214	A
3	West	759.70	759.70	189.93	0.00	186.07	759.69	517.48	248.83	0.00	1637.81	1376.11	0.464	0.92	0.93	4.404	A
3	East	624.28	517.48	129.37	106.80	0.00	517.48	908.33	100.19	0.00	1743.39	1685.64	0.297	0.44	0.44	3.082	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	355.10		88.77			356.45	169.86	423.80	0.00	976.42	672.18	0.364	0.98	0.64	6.419	A
1	West	620.30		155.07			624.71	576.31	203.94	0.00	1103.67	999.12	0.562	2.51	1.41	8.149	A
1	East	509.72		127.43			511.27	746.27	82.39	0.00	1174.02	1145.44	0.434	1.19	0.81	5.667	A
2	North	355.10		88.77			355.45	169.18	422.87	0.00	1887.00	980.79	0.188	0.35	0.26	2.592	A
2	West	620.30		155.07			621.02	574.95	203.37	0.00	2045.68	1787.02	0.303	0.65	0.47	2.718	A
2	East	509.72		127.43			510.14	742.49	81.90	0.00	2133.50	2022.33	0.239	0.43	0.33	2.310	A
3	North	355.10	203.17	50.79	151.93	87.20	203.39	81.96	422.95	0.00	1514.14	617.27	0.134	0.22	0.17	2.938	A
3	West	620.30	620.30	155.07	0.00	151.93	621.44	422.95	203.39	0.00	1670.09	1376.11	0.371	0.93	0.64	3.692	A
3	East	509.72	422.52	105.63	87.20	0.00	422.95	742.87	81.96	0.00	1756.34	1685.64	0.241	0.44	0.33	2.835	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	297.38		74.34			298.09	141.93	354.55	0.00	1016.50	672.18	0.293	0.64	0.46	5.533	A
1	West	519.47		129.87			521.35	482.09	170.55	0.00	1122.99	999.12	0.463	1.41	0.94	6.448	A
1	East	426.87		106.72			427.72	623.14	68.76	0.00	1181.91	1145.44	0.361	0.81	0.59	4.974	A
2	North	297.38		74.34			297.60	141.64	354.07	0.00	1936.74	980.79	0.154	0.26	0.20	2.423	A
2	West	519.47		129.87			519.90	481.39	170.27	0.00	2069.61	1787.02	0.251	0.47	0.36	2.498	A
2	East	426.87		106.72			427.14	621.61	68.57	0.00	2143.14	2022.33	0.199	0.33	0.26	2.184	A
3	North	297.38	170.14	42.54	127.23	73.03	170.29	68.59	354.12	0.00	1563.03	617.27	0.109	0.17	0.13	2.767	A
3	West	519.47	519.47	129.87	0.00	127.23	520.11	354.12	170.29	0.00	1693.60	1376.11	0.307	0.64	0.48	3.297	A

3	East	426.87	353.84	88.46	73.03	0.00	354.12	621.80	68.59	0.00	1765.83	1685.64	0.200	0.33	0.26	2.679	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.55	0.44	5.482	A	A
1	West	13.10	0.87	6.325	A	A
1	East	8.47	0.57	4.931	A	A
2	North	2.95	0.20	2.418	A	A
2	West	5.29	0.35	2.490	A	A
2	East	3.82	0.25	2.181	A	A
3	North	1.92	0.13	2.763	A	A
3	West	6.94	0.46	3.282	A	A
3	East	3.87	0.26	2.673	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.09	0.61	6.364	A	A
1	West	19.47	1.30	7.933	A	A
1	East	11.55	0.77	5.624	A	A
2	North	3.78	0.25	2.590	A	A
2	West	6.89	0.46	2.712	A	A
2	East	4.83	0.32	2.307	A	A
3	North	2.45	0.16	2.936	A	A
3	West	9.29	0.62	3.680	A	A
3	East	4.91	0.33	2.833	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	13.96	0.93	8.088	A	A
1	West	34.30	2.29	11.817	B	B
1	East	17.15	1.14	6.902	A	A
2	North	5.11	0.34	2.868	A	A
2	West	9.56	0.64	3.083	A	A
2	East	6.41	0.43	2.504	A	A
3	North	3.27	0.22	3.213	A	A
3	West	13.49	0.90	4.393	A	A
3	East	6.52	0.43	3.082	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	14.58	0.97	8.145	A	A
1	West	37.35	2.49	12.135	B	B
1	East	17.87	1.19	6.946	A	A
2	North	5.18	0.35	2.868	A	A
2	West	9.73	0.65	3.086	A	A
2	East	6.50	0.43	2.504	A	A
3	North	3.32	0.22	3.214	A	A
3	West	13.86	0.92	4.404	A	A
3	East	6.63	0.44	3.082	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.86	0.66	6.419	A	A
1	West	22.17	1.48	8.149	A	A
1	East	12.48	0.83	5.667	A	A
2	North	3.90	0.26	2.592	A	A
2	West	7.15	0.48	2.718	A	A
2	East	4.98	0.33	2.310	A	A
3	North	2.53	0.17	2.938	A	A
3	West	9.79	0.65	3.692	A	A
3	East	5.08	0.34	2.835	A	A

Queueing Delay results: (09:15-09:30)

Intersection	Leg	(PCE)	(PCE)	(PCE)	(PCE)	(PCE)	Percentile Message	Message	Or Exceeding Marker	Reaching Marker
1	North	0.98	0.00	0.00	0.00	1.10			N/A	N/A
1	West	2.51	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	1.19	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.35	-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
2	West	0.65	0.00	0.00	0.00	1.07			N/A	N/A
2	East	0.43	-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
3	North	0.22	-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
3	West	0.93	-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
3	East	0.44	-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)

Intersection	Leg	Mean (s)	Q05 (s)	Q50 (s)	Q95 (s)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.64	-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
1	West	1.41	0.00	0.00	2.15	3.22			N/A	N/A
1	East	0.81	-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
2	North	0.26	-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
2	West	0.47	-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
2	East	0.33	-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
3	North	0.17	-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
3	West	0.64	-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
3	East	0.33	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.46	-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
1	West	0.94	0.00	0.00	1.07	2.15			N/A	N/A
1	East	0.59	-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
2	North	0.20	-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
2	West	0.36	-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
2	East	0.26	-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
3	North	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
3	West	0.48	-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
3	East	0.26	-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

Queuing and Blocking Report

Background - 2035
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	32.5	113.8	70.0	30.3	91.5	46.3	48.0	26.9	53.8
Average Queue (m)	12.2	52.9	17.3	10.1	35.8	19.6	20.5	8.9	20.5
95th Queue (m)	24.7	91.4	50.4	22.3	65.5	37.1	38.1	23.8	41.4
Link Distance (m)	902.3			568.8			768.8		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		20.0
Storage Blk Time (%)	25		1		2		14		9
Queuing Penalty (veh)	52		5		1		24		10
							10		5
									2

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	32.8	32.6	57.8	50.1
Average Queue (m)	14.9	15.0	30.3	21.4
95th Queue (m)	24.9	25.7	50.1	37.3
Link Distance (m)	408.4	523.0	2603.2	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	77.4	32.6	46.8
Average Queue (m)	29.0	11.9	20.9
95th Queue (m)	66.6	27.5	38.4
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 99

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	80	808	214	58	822	42	174	158	96	43	205	96
Future Volume (vph)	80	808	214	58	822	42	174	158	96	43	205	96
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0	20.0	55.0	0.0	20.0	0.0	20.0	0.0	20.0	0.0	20.0	0.0
Storage Lanes	1	1	1	0	1	0	1	0	1	0	1	0
Taper Length (m)	100.0	80.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.850	0.993	0.943	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952	0.952
Flt Protected	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (prot)	1348	1597	1054	1401	1340	0	1299	1229	0	1299	1220	0
Flt Permitted	0.086	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Satd. Flow (perm)	122	1597	1054	142	1340	0	570	1229	0	655	1220	0
Right Turn on Red	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Satd. Flow (RTOR)	76	4	4	4	4	4	4	4	4	4	4	4
Link Speed (k/h)	50	50	50	50	50	50	50	50	50	50	50	50
Link Distance (m)	936.7	581.5	783.0	2628.2	2628.2	2628.2	2628.2	2628.2	2628.2	2628.2	2628.2	2628.2
Travel Time (s)	67.4	41.9	56.4	189.2	189.2	189.2	189.2	189.2	189.2	189.2	189.2	189.2
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	87	878	233	63	893	46	189	172	104	47	223	104
Shared Lane Traffic (%)	87	878	233	63	939	0	189	276	0	47	327	0
Lane Group Flow (vph)	87	878	233	63	939	0	189	276	0	47	327	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	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Link Offset(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
Crosswalk Width(m)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Two way Left Turn Lane	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Headway Factor	25	15	25	15	25	15	25	15	25	15	25	15
Turning Speed (k/h)	1	2	1	1	2	1	2	1	2	1	2	1
Number of Detectors	Left	Thru	Right	Left	Thru	Left	Thru	Left	Thru	Left	Thru	Left
Detector Template	2.0	10.0	2.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0
Leading 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
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)	2.0	0.6	2.0	2.0	0.6	2.0	0.6	2.0	0.6	2.0	0.6	2.0
Detector 1 Size(m)	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 1 Type	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 Channel	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 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	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
Detector 2 Size(m)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Detector 2 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex
Detector 2 Channel	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 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
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	4	8	2	6	2	6	2	6	2	6	2	6

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	46.3	46.3	46.3	46.3	46.3		31.1	31.1		31.1	31.1	
Actuated g/C Ratio	0.54	0.54	0.54	0.54	0.54		0.36	0.36		0.36	0.36	
v/c Ratio	1.32	1.02	0.39	0.83	1.29		0.91	0.58		0.20	0.71	
Control Delay	247.3	57.6	10.7	90.9	163.8		71.5	23.7		20.3	29.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	247.3	57.6	10.7	90.9	163.8		71.5	23.7		20.3	29.8	
LOS	F	E	B	F	F		E	C		C	C	
Approach Delay		62.3			159.2			43.1			28.6	
Approach LOS		E			F			D			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 85.4

Natural Cycle: 115

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 87.2

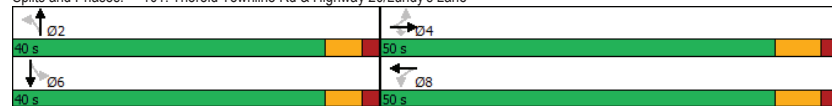
Intersection LOS: F

Intersection Capacity Utilization 127.7%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane



Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	878	233	63	939	189	276	47	327
v/c Ratio	1.32	1.02	0.39	0.83	1.29	0.91	0.58	0.20	0.71
Control Delay	247.3	57.6	10.7	90.9	163.8	71.5	23.7	20.3	29.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	247.3	57.6	10.7	90.9	163.8	71.5	23.7	20.3	29.8
Queue Length 50th (m)	~21.4	~179.7	15.7	9.6	~229.6	30.2	31.8	5.4	42.5
Queue Length 95th (m)	#41.1	#252.0	33.7	#36.2	#305.1	#70.8	57.1	13.5	74.0
Internal Link Dist (m)		912.7			557.5		759.0		2604.2
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	66	865	605	76	728	242	544	278	535
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.32	1.02	0.39	0.83	1.29	0.78	0.51	0.17	0.61

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.

HCM Signalized Intersection Capacity Analysis
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2035
PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	80	808	214	58	822	42	174	158	96	43	205	96
Future Volume (vph)	80	808	214	58	822	42	174	158	96	43	205	96
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	1597	1054	1401	1340		1299	1230		1299	1221	
Flt Permitted	0.09	1.00	1.00	0.10	1.00		0.42	1.00		0.48	1.00	
Satd. Flow (perm)	123	1597	1054	142	1340		570	1230		655	1221	
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)	87	878	233	63	893	46	189	172	104	47	223	104
RTOR Reduction (vph)	0	0	35	0	2	0	0	25	0	0	20	0
Lane Group Flow (vph)	87	878	198	63	937	0	189	251	0	47	307	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	43.3	43.3	43.3	43.3	43.3		29.0	29.0		29.0	29.0	
Effective Green, g (s)	46.3	46.3	46.3	46.3	46.3		31.0	31.0		31.0	31.0	
Actuated g/C Ratio	0.54	0.54	0.54	0.54	0.54		0.36	0.36		0.36	0.36	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	66	866	572	77	727		207	447		238	443	
v/s Ratio Prot		0.55			0.70			0.20			0.25	
v/s Ratio Perm	c0.71		0.19	0.44			c0.33			0.07		
v/c Ratio	1.32	1.01	0.35	0.82	1.29		0.91	0.56		0.20	0.69	
Uniform Delay, d1	19.5	19.5	11.0	16.0	19.5		25.9	21.7		18.6	23.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	217.5	34.1	0.4	46.6	140.3		39.1	1.6		0.4	4.7	
Delay (s)	237.0	53.6	11.3	62.7	159.8		65.0	23.3		19.0	27.8	
Level of Service	F	D	B	E	F		E	C		B	C	
Approach Delay (s)		58.7			153.7			40.2			26.7	
Approach LOS		E			F			D			C	
Intersection Summary												
HCM 2000 Control Delay		83.3			HCM 2000 Level of Service			F				
HCM 2000 Volume to Capacity ratio		1.15										
Actuated Cycle Length (s)		85.3			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		127.7%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

Lanes, Volumes, Timings
102: Thorold Townline Rd & Beaverdams Rd

Background - 2035
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰			↰			↰	
Traffic Volume (vph)	45	249	48	122	210	33	49	228	93	41	311	82
Future Volume (vph)	45	249	48	122	210	33	49	228	93	41	311	82
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.988			0.966			0.975	
Flt Protected		0.993			0.984			0.993			0.995	
Satd. Flow (prot)	0	1428	0	0	1428	0	0	1343	0	0	1350	0
Flt Permitted		0.993			0.984			0.993			0.995	
Satd. Flow (perm)	0	1428	0	0	1428	0	0	1343	0	0	1350	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2628.2			714.3	
Travel Time (s)		30.1			38.7			189.2			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	49	271	52	133	228	36	53	248	101	45	338	89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	372	0	0	397	0	0	402	0	0	472	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			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 97.3%	ICU Level of Service F											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis
102: Thorold Townline Rd & Beaverdams Rd

Background - 2035
PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	45	249	48	122	210	33	49	228	93	41	311	82
Future Volume (vph)	45	249	48	122	210	33	49	228	93	41	311	82
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)	49	271	52	133	228	36	53	248	101	45	338	89
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	372	397	402	472								
Volume Left (vph)	49	133	53	45								
Volume Right (vph)	52	36	101	89								
Hadj (s)	-0.04	0.03	-0.02	0.02								
Departure Headway (s)	9.5	9.6	9.5	9.5								
Degree Utilization, x	0.98	1.05	1.06	1.25								
Capacity (veh/h)	372	382	385	383								
Control Delay (s)	74.1	93.0	95.0	161.7								
Approach Delay (s)	74.1	93.0	95.0	161.7								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay	109.0											
Level of Service	F											
Intersection Capacity Utilization	97.3%			ICU Level of Service			F					
Analysis Period (min)	15											

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Background - 2035
PM Peak Hour

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	192	895	827	260	193	143
Future Volume (vph)	192	895	827	260	193	143
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.968			0.943	
Flt Protected		0.991			0.972	
Satd. Flow (prot)	0	1201	1304	0	1304	0
Flt Permitted		0.991			0.972	
Satd. Flow (perm)	0	1201	1304	0	1304	0
Link Speed (k/h)		50			50	
Link Distance (m)		1017.3			470.3	
Travel Time (s)		73.2			33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	209	973	899	283	210	155
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1182	1182	0	365	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	
Link Offset(m)		0.0			0.0	
Crosswalk Width(m)		4.8			4.8	
Two way Left Turn Lane						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type: Roundabout						
Intersection Capacity Utilization 205.5%			ICU Level of Service H			
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Background - 2035
PM Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	192	895	827	260	193	143
Future Volume (veh/h)	192	895	827	260	193	143
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	209	973	899	283	210	155
Approach Volume (veh/h)	1182	1182		365		
Crossing Volume (veh/h)		210	209	899		
High Capacity (veh/h)	1175	1176		676		
High v/c (veh/h)	1.01	1.01		0.54		
Low Capacity (veh/h)	971	972		529		
Low v/c (veh/h)	1.22	1.22		0.69		
Intersection Summary						
Maximum v/c High		1.01				
Maximum v/c Low		1.22				
Intersection Capacity Utilization		205.5%		ICU Level of Service		H

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Background - 2035
PM Peak Hour

Intersection			
Intersection Delay, s/veh	66.4		
Intersection LOS	F		
Approach			
	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1182	1182	365
Demand Flow Rate, veh/h	1198	1217	380
Vehicles Circulating, veh/h	210	215	926
Vehicles Exiting, veh/h	1096	1193	506
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	68.6	76.7	25.7
Approach LOS	F	F	D
Lane			
	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1198	1217	380
Cap Entry Lane, veh/h	1114	1108	537
Entry HV Adj Factor	0.987	0.971	0.961
Flow Entry, veh/h	1182	1182	365
Cap Entry, veh/h	1099	1076	515
V/C Ratio	1.076	1.098	0.708
Control Delay, s/veh	68.6	76.7	25.7
LOS	F	F	D
95th %tile Queue, veh	27	29	6

Junctions 8									
ARCADY 8 - Roundabout Module									
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:29:20 PM

Summary of intersection performance

	PM							
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	
A1 - BG 2035								
Intersection 1 - Leg North	1.04	?	10.28	0.50	B	150.51	F	
Intersection 1 - Leg West	68.31	126.68	185.15	1.10	F			
Intersection 1 - Leg East	57.63	117.42	158.70	1.08	F			
Intersection 2 - Leg North	0.33	~1	3.23	0.24	A	4.26	A	
Intersection 2 - Leg West	1.48	1.01	4.42	0.60	A			
Intersection 2 - Leg East	1.47	1.03	4.43	0.59	A			
Intersection 3 - Leg North	0.22	~1	3.78	0.18	A	6.16	A	
Intersection 3 - Leg West	2.69	4.05	8.09	0.73	A			
Intersection 3 - Leg East	1.25	1.03	4.95	0.55	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:29:19 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	km/h	PCE	PCE	per/hour	s	-/min	per/min

(Default Analysis Set) - BG 2035, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
BG 2035, PM	BG 2035	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				150.51	F
2	2	Dual Lane	Roundabout	North,West,East				4.26	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				6.16	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/Unknown

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	336.00	100.000
1	West	ONE HOUR	✓	1102.00	100.000
1	East	ONE HOUR	✓	1092.00	100.000
2	North	ONE HOUR	✓	336.00	100.000

2	West	ONE HOUR	✓	1102.00	100.000
2	East	ONE HOUR	✓	1092.00	100.000
3	North	ONE HOUR	✓	336.00	100.000
3	West	ONE HOUR	✓	1102.00	100.000
3	East	ONE HOUR	✓	1092.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
	North	0.000	143.000	193.000
	West	192.000	0.000	910.000
	East	260.000	832.000	0.000

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

From	To			
	North	West	East	
	North	0.00	0.43	0.57
	West	0.17	0.00	0.83
	East	0.24	0.76	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
	North	0.000	143.000	193.000
	West	192.000	0.000	910.000
	East	260.000	832.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
	North	0.00	0.43	0.57
	West	0.17	0.00	0.83
	East	0.24	0.76	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
	North	0.000	143.000	193.000
	West	192.000	0.000	910.000
	East	260.000	832.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
	North	0.00	0.43	0.57
	West	0.17	0.00	0.83
	East	0.24	0.76	0.00

Vehicle Mix

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

From	To			
	North	West	East	
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 1 (for whole period)

From	To			
	North	West	East	
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0

	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From		To		
		North	West	East
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 2 (for whole period)

From		To		
		North	West	East
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From		To		
		North	West	East
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 3 (for whole period)

From		To		
		North	West	East
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
	East	3.0	3.0	0.0

Results

Results Summary for whole modelled period

Intersection	Log	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.50	10.28	1.04	?	B	308.32	462.48	64.10	8.32	0.71	64.11	8.32
1	West	1.10	185.15	68.31	126.68	F	1011.21	1516.82	2274.93	89.99	25.28	2275.16	90.00
1	East	1.08	158.70	57.63	117.42	F	1002.04	1503.06	1900.51	75.87	21.12	1900.75	75.88
2	North	0.24	3.23	0.33	~1	A	308.32	462.48	22.12	2.87	0.25	22.12	2.87
2	West	0.60	4.42	1.48	1.01	A	1011.21	1516.82	91.61	3.62	1.02	91.61	3.62
2	East	0.59	4.43	1.47	1.03	A	1002.04	1503.06	91.27	3.64	1.01	91.28	3.64
3	North	0.18	3.78	0.22	~1	A	308.32	265.65	14.86	3.36	0.17	14.86	3.36
3	West	0.73	8.09	2.69	4.05	A	1011.21	1516.82	149.13	5.90	1.66	149.15	5.90
3	East	0.55	4.95	1.25	1.03	A	1002.04	1145.19	79.20	4.15	0.88	79.20	4.15

Main Results for each time segment

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	252.96		63.24			251.25	336.04	618.58	0.00	863.69	726.56	0.293	0.00	0.43	6.097	A
1	West	829.64	207.41				819.23	725.52	144.32	0.00	1138.17	980.16	0.729	0.00	2.60	11.105	B
1	East	822.11		205.53			811.69	820.82	142.73	0.00	1139.09	1122.86	0.722	0.00	2.56	11.016	B
2	North	252.96		63.24			252.25	339.19	624.35	0.00	1741.34	1105.21	0.145	0.00	0.18	2.513	A
2	West	829.64	207.41				826.98	731.70	144.90	0.00	2087.96	1733.75	0.397	0.00	0.66	2.887	A
2	East	822.11		205.53			819.45	827.80	144.08	0.00	2088.54	1974.33	0.394	0.00	0.67	2.915	A
3	North	252.96	145.30	36.33	107.66	195.74	144.83	143.89	624.01	0.00	1371.33	644.95	0.106	0.00	0.12	2.935	A
3	West	829.64	829.64	207.41	0.00	107.66	825.86	624.01	144.83	0.00	1711.68	1356.46	0.485	0.00	0.94	4.102	A
3	East	822.11	626.37	156.59	195.74	0.00	624.01	826.80	143.89	0.00	1712.35	1646.69	0.366	0.00	0.59	3.400	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	302.06		75.51			301.25	400.45	737.43	0.00	794.91	726.56	0.380	0.43	0.63	7.573	A
1	West	990.68		247.67			975.78	865.64	173.04	0.00	1121.55	980.16	0.883	2.60	6.33	22.931	C
1	East	981.69		245.42			967.87	978.81	170.01	0.00	1123.31	1122.86	0.874	2.56	6.01	22.067	C
2	North	302.06		75.51			301.83	405.91	747.16	0.00	1652.55	1105.21	0.183	0.18	0.23	2.772	A
2	West	990.68		247.67			989.63	875.62	173.38	0.00	2067.37	1733.75	0.479	0.66	0.93	3.382	A
2	East	981.69		245.42			980.65	990.58	172.42	0.00	2068.06	1974.33	0.475	0.67	0.92	3.407	A
3	North	302.06	173.50	43.38	128.55	233.73	173.35	172.28	747.07	0.00	1283.92	644.94	0.135	0.12	0.16	3.241	A
3	West	990.68	990.68	247.67	0.00	128.55	988.80	747.07	173.35	0.00	1691.42	1356.46	0.586	0.94	1.41	5.179	A
3	East	981.69	747.95	186.99	233.73	0.00	747.07	989.88	172.28	0.00	1692.19	1646.69	0.442	0.59	0.81	3.920	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North			92.49			368.39	448.65	831.83	0.00	740.27	726.56	0.500	0.63	1.02	10.027	B
1	West	1213.32		303.33			1083.10	988.62	211.61	0.00	1099.23	980.16	1.104	6.33	38.88	87.770	F
1	East	1202.31		300.58			1091.78	1106.00	188.71	0.00	1112.48	1122.86	1.081	6.01	33.64	78.284	F
2	North	369.94		92.49			369.55	496.77	914.41	0.00	1531.64	1105.21	0.242	0.23	0.33	3.222	A
2	West	1213.32		303.33			1211.14	1071.69	212.27	0.00	2039.25	1733.75	0.595	0.93	1.47	4.394	A
2	East	1202.31		300.58			1200.17	1212.40	211.02	0.00	2040.16	1974.33	0.589	0.92	1.46	4.402	A
3	North	369.94	212.50	53.12	157.45	286.27	212.23	210.54	914.31	0.00	1165.14	644.94	0.182	0.16	0.22	3.778	A
3	West	1213.32	1213.32	303.33	0.00	157.45	1208.40	914.31	212.23	0.00	1663.81	1356.46	0.729	1.41	2.65	7.926	A
3	East	1202.31	916.05	229.01	286.27	0.00	914.31	1210.09	210.54	0.00	1665.01	1646.69	0.550	0.81	1.24	4.929	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	369.94		92.49			369.94	454.30	842.93	0.00	733.84	726.56	0.504	1.02	1.04	10.282	B
1	West	1213.32		303.33			1095.62	1000.34	212.44	0.00	1098.75	980.16	1.104	38.88	68.31	185.150	F
1	East	1202.31		300.58			1106.35	1117.17	190.89	0.00	1111.22	1122.86	1.082	33.64	57.63	158.695	F
2	North	369.94		92.49			369.94	497.65	916.02	0.00	1530.47	1105.21	0.242	0.33	0.33	3.226	A
2	West	1213.32		303.33			1213.29	1073.47	212.49	0.00	2039.09	1733.75	0.595	1.47	1.48	4.417	A
2	East	1202.31		300.58			1202.28	1214.39	211.39	0.00	2039.89	1974.33	0.589	1.46	1.47	4.426	A
3	North	369.94	212.50	53.12	157.45	286.27	212.49	211.37	916.02	0.00	1163.92	644.94	0.183	0.22	0.22	3.782	A
3	West	1213.32	1213.32	303.33	0.00	157.45	1213.16	916.02	212.49	0.00	1663.62	1356.46	0.729	2.65	2.69	8.090	A
3	East	1202.31	916.05	229.01	286.27	0.00	916.02	1214.29	211.37	0.00	1664.42	1646.69	0.550	1.24	1.25	4.954	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	302.06		75.51			303.32	452.15	831.11	0.00	740.69	726.56	0.408	1.04	0.73	8.588	A
1	West	990.68		247.67			1104.48	960.20	174.23	0.00	1120.87	980.16	0.884	68.31	39.86	178.434	F
1	East	981.69		245.42			1090.83	1086.27	192.43	0.00	1110.33	1122.86	0.884	57.63	30.35	148.132	F
2	North	302.06		75.51			302.44	407.22	749.57	0.00	1650.81	1105.21	0.183	0.33	0.23	2.777	A
2	West	990.68		247.67			992.84	878.29	173.73	0.00	2067.12	1733.75	0.479	1.48	0.94	3.404	A
2	East	981.69		245.42			983.81	993.58	172.98	0.00	2067.65	1974.33	0.475	1.47	0.94	3.427	A
3	North	302.06	173.50	43.38	128.55	233.73	173.77	173.46	749.67	0.00	1282.07	644.94	0.135	0.22	0.16	3.248	A
3	West	990.68	990.68	247.67	0.00	128.55	995.61	749.67	173.77	0.00	1691.13	1356.46	0.586	2.69	1.45	5.281	A
3	East	981.69	747.95	186.99	233.73	0.00	749.67	995.91	173.46	0.00	1691.34	1646.69	0.442	1.25	0.82	3.944	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	252.96		63.24			253.96	392.04	709.67	0.00	810.97	726.56	0.312	0.73	0.48	6.737	A

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.18	0.41	6.097	A	A
1	West	35.44	2.36	11.105	B	B
1	East	34.67	2.32	11.016	B	B
2	North	2.60	0.17	2.513	A	A
2	West	9.75	0.65	2.887	A	A
2	East	9.76	0.65	2.915	A	A
3	North	1.74	0.12	2.935	A	A
3	West	13.73	0.92	4.102	A	A
3	East	8.65	0.58	3.400	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.15	0.61	7.573	A	A
1	West	79.99	5.33	22.931	C	C
1	East	76.69	5.11	22.067	C	C
2	North	3.44	0.23	2.772	A	A
2	West	13.61	0.91	3.382	A	A
2	East	13.59	0.91	3.407	A	A
3	North	2.30	0.15	3.241	A	A
3	West	20.53	1.37	5.179	A	A
3	East	11.90	0.79	3.920	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	14.58	0.97	10.027	B	B
1	West	350.91	23.39	87.770	F	F
1	East	310.95	20.73	76.384	F	E
2	North	4.87	0.32	3.222	A	A
2	West	21.40	1.43	4.394	A	A
2	East	21.26	1.42	4.402	A	A
3	North	3.28	0.22	3.778	A	A
3	West	37.31	2.49	7.926	A	A
3	East	18.12	1.21	4.929	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	15.51	1.03	10.282	B	B
1	West	804.89	53.66	185.150	F	F
1	East	685.88	45.73	158.695	F	F
2	North	4.96	0.33	3.226	A	A
2	West	22.15	1.48	4.417	A	A
2	East	21.99	1.47	4.426	A	A
3	North	3.34	0.22	3.782	A	A
3	West	40.06	2.67	8.090	A	A
3	East	18.75	1.25	4.954	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	11.32	0.75	8.588	A	A
1	West	811.27	54.08	178.434	F	F
1	East	659.85	43.99	148.132	F	F
2	North	3.56	0.24	2.777	A	A
2	West	14.43	0.96	3.404	A	A
2	East	14.40	0.96	3.427	A	A
3	North	2.39	0.16	3.248	A	A
3	West	22.68	1.51	5.281	A	A
3	East	12.65	0.84	3.944	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	7.37	0.49	6.737	A	A
1	West	192.43	12.83	42.016	E	D
1	East	132.27	8.82	29.801	D	C
2	North	2.70	0.18	2.519	A	A
2	West	10.26	0.68	2.906	A	A

2	East	10.26	0.68	2.933	A	A
3	North	1.81	0.12	2.944	A	A
3	West	14.82	0.99	4.158	A	A
3	East	9.14	0.61	3.424	A	A

Queue Variation Results for each time segment

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.43	~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
1	West	2.60	0.00	1.01	4.05	6.08			N/A	N/A
1	East	2.56	0.00	1.03	4.12	5.15			N/A	N/A
2	North	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
2	West	0.66	~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
2	East	0.67	~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
3	North	0.12	~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
3	West	0.94	~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
3	East	0.59	~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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.63	~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
1	West	6.33	0.00	2.03	15.20	21.28			N/A	N/A
1	East	6.01	0.00	2.06	14.42	20.60			N/A	N/A
2	North	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
2	West	0.93	0.00	0.00	1.01	1.01			N/A	N/A
2	East	0.92	0.00	0.00	1.03	1.03			N/A	N/A
3	North	0.16	~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
3	West	1.41	0.00	0.00	3.04	4.05			N/A	N/A
3	East	0.81	0.00	0.00	0.00	1.03			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.02	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	38.88	11.15	34.46	65.87	78.03			N/A	N/A
1	East	33.64	7.21	28.84	60.77	73.13			N/A	N/A
2	North	0.33	~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
2	West	1.47	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.46	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.22	~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
3	West	2.65	0.00	0.00	0.00	3.04			N/A	N/A
3	East	1.24	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.04	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	68.31	24.32	62.83	110.46	126.68			N/A	N/A
1	East	57.63	15.45	50.47	99.91	117.42			N/A	N/A
2	North	0.33	~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
2	West	1.48	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.47	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.22	~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
3	West	2.69	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

3	East	1.25	?	?	?	?	because the mean queue is very small or very big.		N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q80 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.73	~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
1	West	39.86	13.17	35.47	64.86	74.99			N/A	N/A
1	East	30.35	6.18	25.75	54.59	64.89			N/A	N/A
2	North	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
2	West	0.94	0.00	0.00	0.00	1.01			N/A	N/A
2	East	0.94	~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
3	North	0.16	~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
3	West	1.45	0.00	0.00	2.03	3.04			N/A	N/A
3	East	0.82	~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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q80 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.48	~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
1	West	2.96	0.00	0.00	1.01	8.11			N/A	N/A
1	East	3.01	0.00	0.00	2.06	9.27			N/A	N/A
2	North	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
2	West	0.67	~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
2	East	0.67	~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
3	North	0.12	~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
3	West	0.96	0.00	0.00	1.01	2.03			N/A	N/A
3	East	0.60	~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

Queuing and Blocking ReportBackground - 2035
PM Peak Hour**Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane**

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	88.8	179.3	70.0	134.9	586.7	69.9	195.2	61.4	81.7
Average Queue (m)	38.1	98.3	48.0	68.9	539.3	47.4	69.9	11.1	40.3
95th Queue (m)	78.4	158.0	91.5	172.4	687.6	78.3	166.6	33.7	69.4
Link Distance (m)	902.3				568.8	768.8		2603.2	
Upstream Blk Time (%)					75				
Queuing Penalty (veh)					0				
Storage Bay Dist (m)	90.0			20.0	55.0	20.0		20.0	
Storage Blk Time (%)	1	43	5	58		65	25	2	33
Queuing Penalty (veh)	10	126	44	34		164	44	7	14

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	76.1	79.7	80.5	137.6
Average Queue (m)	30.9	34.9	39.9	72.6
95th Queue (m)	58.1	73.1	68.0	150.8
Link Distance (m)	408.4	523.0	2603.2	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	1005.0	710.8	50.2
Average Queue (m)	848.5	384.1	20.1
95th Queue (m)	1282.3	743.8	37.6
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)	43		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 443

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Appendix F3

2040 Background Operations Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	71	655	157	50	455	37	117	144	52	24	112	37
Future Volume (vph)	71	655	157	50	455	37	117	144	52	24	112	37
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
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			0.98									
Frt			0.850			0.989			0.960			0.963
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	1566	973	1287	1307	0	1171	1176	0	836	1145	0
Flt Permitted	0.371			0.249			0.636			0.554		
Satd. Flow (perm)	542	1566	952	337	1307	0	784	1176	0	487	1145	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			69		7			24			22	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			2628.2	
Travel Time (s)		67.4			41.9			56.4			189.2	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	77	712	171	54	495	40	127	214	57	26	122	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	712	171	54	535	0	127	214	0	26	162	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

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Lanes, Volumes, Timings

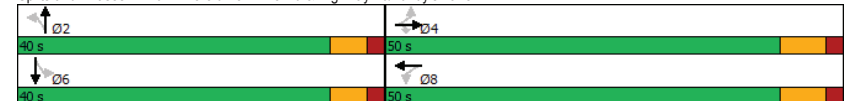
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	38.1	38.1	38.1	38.1	38.1		19.6	19.6		19.6	19.6	
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58		0.30	0.30		0.30	0.30	
v/c Ratio	0.25	0.79	0.30	0.28	0.71		0.55	0.59		0.18	0.46	
Control Delay	10.8	20.3	6.8	13.3	17.5		31.5	26.2		22.7	22.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.8	20.3	6.8	13.3	17.5		31.5	26.2		22.7	22.5	
LOS	B	C	A	B	B		C	C		C	C	
Approach Delay		17.1			17.1			28.2			22.6	
Approach LOS		B			B			C			C	
Intersection Summary												
Area Type:	Other											
Cycle Length: 90												
Actuated Cycle Length: 66.2												
Natural Cycle: 85												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.79												
Intersection Signal Delay: 19.4												
Intersection Capacity Utilization 93.2%												
Analysis Period (min) 15												
Intersection LOS: B												
ICU Level of Service F												

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	77	712	171	54	535	127	214	26	162
v/c Ratio	0.25	0.79	0.30	0.28	0.71	0.55	0.59	0.18	0.46
Control Delay	10.8	20.3	6.8	13.3	17.5	31.5	26.2	22.7	22.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.8	20.3	6.8	13.3	17.5	31.5	26.2	22.7	22.5
Queue Length 50th (m)	4.2	61.2	5.4	3.0	41.6	14.9	22.4	2.7	15.7
Queue Length 95th (m)	15.5	#168.5	20.3	13.4	109.0	33.2	45.8	9.2	34.1
Internal Link Dist (m)		912.7			557.5		759.0		2604.2
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	392	1135	708	244	949	450	685	279	667
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.63	0.24	0.22	0.56	0.28	0.31	0.09	0.24

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	71	655	157	50	455	37	117	144	52	24	112	37
Future Volume (vph)	71	655	157	50	455	37	117	144	52	24	112	37
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	1566	952	1287	1307		1171	1176		836	1145	
Flt Permitted	0.37	1.00	1.00	0.25	1.00		0.64	1.00		0.55	1.00	
Satd. Flow (perm)	542	1566	952	337	1307		784	1176		487	1145	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	712	171	54	495	40	127	157	57	26	122	40
RTOR Reduction (vph)	0	0	29	0	3	0	0	17	0	0	15	0
Lane Group Flow (vph)	77	712	142	54	532	0	127	197	0	26	147	0
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	34.9	34.9	34.9	34.9	34.9		17.5	17.5		17.5	17.5	
Effective Green, g (s)	37.9	37.9	37.9	37.9	37.9		19.5	19.5		19.5	19.5	
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58		0.30	0.30		0.30	0.30	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	314	907	551	195	757		233	350		145	341	
v/s Ratio Prot		c0.45			0.41			c0.17			0.13	
v/s Ratio Perm	0.14		0.15	0.16			0.16			0.05		
v/c Ratio	0.25	0.79	0.26	0.28	0.70		0.55	0.56		0.18	0.43	
Uniform Delay, d1	6.7	10.6	6.8	6.9	9.8		19.2	19.4		17.0	18.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	4.5	0.2	0.8	3.0		2.6	2.1		0.6	0.9	
Delay (s)	7.1	15.1	7.0	7.7	12.7		21.8	21.4		17.6	19.3	
Level of Service	A	B	A	A	B		C	C		B	B	
Approach Delay (s)		13.0			12.3			21.6			19.1	
Approach LOS		B			B			C			B	

Intersection Summary

HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	65.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
102: Thorold Townline Rd & Beaverdams Rd

Background - 2040
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	47	123	36	83	200	4	41	275	84	18	176	41
Traffic Volume (vph)	47	123	36	83	200	4	41	275	84	18	176	41
Future Volume (vph)	47	123	36	83	200	4	41	275	84	18	176	41
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.976			0.998			0.972			0.976		
Flt Protected	0.989			0.986			0.995			0.996		
Satd. Flow (prot)	0	1394	0	0	1437	0	0	1308	0	0	1186	0
Flt Permitted	0.989			0.986			0.995			0.996		
Satd. Flow (perm)	0	1394	0	0	1437	0	0	1308	0	0	1186	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	418.6			537.1			2628.2			714.3		
Travel Time (s)	30.1			38.7			189.2			51.4		
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	51	134	39	90	217	4	45	299	91	20	191	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	224	0	0	311	0	0	435	0	0	256	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			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop			Stop			Stop			Stop		

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 75.3%
Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
102: Thorold Townline Rd & Beaverdams Rd

Background - 2040
AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	47	123	36	83	200	4	41	275	84	18	176	41
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	47	123	36	83	200	4	41	275	84	18	176	41
Future Volume (vph)	47	123	36	83	200	4	41	275	84	18	176	41
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)	51	134	39	90	217	4	45	299	91	20	191	45
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	224	311	435	256								
Volume Left (vph)	51	90	45	20								
Volume Right (vph)	39	4	91	45								
Hadj (s)	-0.01	0.08	0.06	0.28								
Departure Headway (s)	7.3	7.1	6.6	7.3								
Degree Utilization, x	0.45	0.61	0.80	0.52								
Capacity (veh/h)	432	466	516	443								
Control Delay (s)	16.1	20.5	31.2	17.9								
Approach Delay (s)	16.1	20.5	31.2	17.9								
Approach LOS	C	C	D	C								
Intersection Summary												
Delay		22.9										
Level of Service		C										
Intersection Capacity Utilization		75.3%		ICU Level of Service					D			
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Background - 2040
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	643	491	99	230	174
Future Volume (vph)	95	643	491	99	230	174
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.977		0.942	
Flt Protected		0.994			0.972	
Satd. Flow (prot)	0	1132	1302	0	1229	0
Flt Permitted		0.994			0.972	
Satd. Flow (perm)	0	1132	1302	0	1229	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	103	699	534	108	250	189
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	802	642	0	439	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	144.1%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Background - 2040
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	95	643	491	99	230	174
Future Volume (veh/h)	95	643	491	99	230	174
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	103	699	534	108	250	189
Approach Volume (veh/h)		802	642		439	
Crossing Volume (veh/h)		250	103		534	
High Capacity (veh/h)		1138	1278		908	
High v/c (veh/h)		0.70	0.50		0.48	
Low Capacity (veh/h)		938	1064		732	
Low v/c (veh/h)		0.86	0.60		0.60	
Intersection Summary						
Maximum v/c High	0.70					
Maximum v/c Low	0.86					
Intersection Capacity Utilization	144.1%			ICU Level of Service H		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Background - 2040
AM Peak Hour

Intersection			
Intersection Delay, s/veh	16.6		
Intersection LOS	C		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	802	642	439
Demand Flow Rate, veh/h	865	669	485
Vehicles Circulating, veh/h	268	131	561
Vehicles Exiting, veh/h	778	1002	239
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	22.4	9.7	16.3
Approach LOS	C	A	C
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	865	669	485
Cap Entry Lane, veh/h	1050	1207	779
Entry HV Adj Factor	0.927	0.960	0.905
Flow Entry, veh/h	802	642	439
Cap Entry, veh/h	973	1159	705
V/C Ratio	0.824	0.554	0.623
Control Delay, s/veh	22.4	9.7	16.3
LOS	C	A	C
95th %tile Queue, veh	10	4	4

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
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Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821.26/11/2015]
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:24:33 PM

Summary of intersection performance

	AM						Intersection Delay (s)	Intersection LOS
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS			
	A1 - BG 2040							
Intersection 1 - Leg North	1.08	1.10	8.80	0.50	A	11.17	B	
Intersection 1 - Leg West	3.39	9.66	15.31	0.77	C			
Intersection 1 - Leg East	1.41	1.04	7.65	0.58	A			
Intersection 2 - Leg North	0.37	~1	2.96	0.25	A	2.96	A	
Intersection 2 - Leg West	0.74	1.07	3.26	0.41	A			
Intersection 2 - Leg East	0.48	1.04	2.59	0.32	A			
Intersection 3 - Leg North	0.23	~1	3.31	0.18	A	3.89	A	
Intersection 3 - Leg West	1.08	?	4.76	0.50	A			
Intersection 3 - Leg East	0.50	1.05	3.21	0.32	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:24:32 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - BG 2040, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
BG 2040, AM	BG 2040	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				11.17	B
2	2	Dual Lane	Roundabout	North,West,East				2.96	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				3.89	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width	E - Entry width	F - Effective flare length	R - Entry radius	D - Inscribed circle diameter	PHI - Conflict (entry) angle	Exit

		(m)	(m)	(m)	(m)	(m)	(deg)	Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	404.00	100.000
1	West	ONE HOUR	✓	748.00	100.000

1	East	ONE HOUR	✓	610.00	100.000
2	North	ONE HOUR	✓	404.00	100.000
2	West	ONE HOUR	✓	748.00	100.000
2	East	ONE HOUR	✓	610.00	100.000
3	North	ONE HOUR	✓	404.00	100.000
3	West	ONE HOUR	✓	748.00	100.000
3	East	ONE HOUR	✓	610.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
North	0.000	174.000	230.000	
West	95.000	0.000	653.000	
East	99.000	511.000	0.000	

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

From	To			
	North	West	East	
North	0.00	0.43	0.57	
West	0.13	0.00	0.87	
East	0.16	0.84	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.000	174.000	230.000	
West	95.000	0.000	653.000	
East	99.000	511.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.00	0.43	0.57	
West	0.13	0.00	0.87	
East	0.16	0.84	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.000	174.000	230.000	
West	95.000	0.000	653.000	
East	99.000	511.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.00	0.43	0.57	
West	0.13	0.00	0.87	
East	0.16	0.84	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 1 (for whole period)

To			

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.50	8.80	1.08	1.10	A	370.72	556.08	66.20	7.14	0.74	66.21	7.14
1	West	0.77	15.31	3.39	9.66	C	686.38	1029.57	178.41	10.40	1.98	178.45	10.40
1	East	0.58	7.65	1.41	1.04	A	559.75	839.62	88.69	6.34	0.99	88.70	6.34
2	North	0.25	2.96	0.37	~1	A	370.72	556.08	25.13	2.71	0.28	25.13	2.71
2	West	0.41	3.26	0.74	1.07	A	686.38	1029.57	49.90	2.91	0.55	49.90	2.91
2	East	0.32	2.59	0.48	1.04	A	559.75	839.62	33.72	2.41	0.37	33.72	2.41
3	North	0.18	3.31	0.23	~1	A	370.72	316.58	16.16	3.06	0.18	16.16	3.06
3	West	0.50	4.76	1.08	?	A	686.38	1029.57	69.82	4.07	0.78	69.82	4.07
3	East	0.32	3.21	0.50	1.05	A	559.75	703.35	34.82	2.97	0.39	34.82	2.97

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	304.15		76.04			302.24	145.09	382.51	0.00	1000.32	665.11	0.304	0.00	0.48	5.674	A
1	West	563.13		140.78			558.87	512.68	172.07	0.00	1122.11	1002.55	0.502	0.00	1.07	6.813	A
1	East	459.24		114.81			456.61	659.96	70.98	0.00	1180.62	1148.01	0.389	0.00	0.66	5.160	A
2	North	304.15		76.04			303.32	145.67	383.76	0.00	1915.27	964.62	0.159	0.00	0.21	2.462	A
2	West	563.13		140.78			561.53	514.40	172.68	0.00	2067.87	1795.69	0.272	0.00	0.40	2.564	A
2	East	459.24		114.81			458.11	662.90	71.32	0.00	2141.15	2027.83	0.214	0.00	0.28	2.227	A
3	North	304.15	173.16	43.29	131.00	74.53	172.62	71.25	383.54	0.00	1542.13	614.03	0.112	0.00	0.13	2.810	A
3	West	563.13	563.13	140.78	0.00	131.00	561.00	383.54	172.62	0.00	1691.94	1378.41	0.333	0.00	0.53	3.412	A

3	East	459.24	384.71	96.18	74.53	0.00	383.54	662.37	71.25	0.00	1763.94	1690.21	0.218	0.00	0.29	2.735	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	363.19		90.80			362.43	173.95	458.55	0.00	956.31	665.11	0.380	0.48	0.67	6.678	A
1	West	672.44		168.11			670.14	614.64	206.33	0.00	1102.28	1002.55	0.610	1.07	1.64	8.894	A
1	East	548.38		137.09			547.39	791.36	85.11	0.00	1172.44	1148.01	0.468	0.66	0.90	5.968	A
2	North	363.19		90.80			362.95	174.29	459.12	0.00	1860.79	964.62	0.195	0.21	0.27	2.651	A
2	West	672.44		168.11			671.94	615.44	206.63	0.00	2043.33	1795.69	0.329	0.40	0.52	2.818	A
2	East	548.38		137.09			548.07	793.23	85.34	0.00	2131.01	2027.83	0.257	0.28	0.36	2.368	A
3	North	363.19	206.77	51.69	156.42	89.00	206.62	85.31	459.06	0.00	1488.49	614.03	0.139	0.13	0.17	3.004	A
3	West	672.44	672.44	168.11	0.00	156.42	671.69	459.06	206.62	0.00	1667.80	1378.41	0.403	0.53	0.72	3.878	A
3	East	548.38	459.38	114.84	89.00	0.00	459.06	793.00	85.31	0.00	1753.96	1690.21	0.262	0.29	0.37	2.919	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	444.81		111.20			443.22	212.44	560.96	0.00	897.04	665.11	0.496	0.67	1.07	8.718	A
1	West	823.56		205.89			816.97	751.85	252.33	0.00	1075.66	1002.55	0.766	1.64	3.29	14.572	B
1	East	671.62		167.91			669.64	965.54	103.76	0.00	1161.65	1148.01	0.578	0.90	1.40	7.591	A
2	North	444.81		111.20			444.42	213.41	562.21	0.00	1786.26	964.62	0.249	0.27	0.36	2.959	A
2	West	823.56		205.89			822.70	753.62	253.01	0.00	2009.80	1795.69	0.410	0.52	0.74	3.254	A
2	East	671.62		167.91			671.13	971.22	104.49	0.00	2117.17	2027.83	0.317	0.36	0.48	2.593	A
3	North	444.81	253.23	63.31	191.58	109.00	252.99	104.41	562.11	0.00	1415.30	614.03	0.179	0.17	0.23	3.314	A
3	West	823.56	823.56	205.89	0.00	191.58	822.13	562.11	252.99	0.00	1634.85	1378.41	0.504	0.72	1.08	4.746	A
3	East	671.62	562.62	140.66	109.00	0.00	562.11	970.71	104.41	0.00	1740.39	1690.21	0.323	0.37	0.50	3.206	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	444.81		111.20			444.77	213.53	562.57	0.00	896.11	665.11	0.496	1.07	1.08	8.797	A
1	West	823.56		205.89			823.14	754.13	253.21	0.00	1075.15	1002.55	0.766	3.29	3.39	15.314	C
1	East	671.62		167.91			671.57	971.80	104.54	0.00	1161.20	1148.01	0.578	1.40	1.41	7.654	A
2	North	444.81		111.20			444.81	213.60	562.62	0.00	1785.97	964.62	0.249	0.36	0.37	2.960	A
2	West	823.56		205.89			823.55	754.19	253.23	0.00	2009.64	1795.69	0.410	0.74	0.74	3.257	A
2	East	671.62		167.91			671.62	972.19	104.60	0.00	2117.09	2027.83	0.317	0.48	0.48	2.593	A
3	North	444.81	253.23	63.31	191.58	109.00	253.23	104.59	562.62	0.00	1414.94	614.03	0.179	0.23	0.23	3.315	A
3	West	823.56	823.56	205.89	0.00	191.58	823.54	562.62	253.23	0.00	1634.69	1378.41	0.504	1.08	1.08	4.764	A
3	East	671.62	562.62	140.66	109.00	0.00	562.62	972.18	104.59	0.00	1740.26	1690.21	0.323	0.50	0.50	3.209	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	363.19		90.80			364.75	175.57	461.01	0.00	954.89	665.11	0.380	1.08	0.69	6.745	A
1	West	672.44		168.11			679.12	618.11	207.66	0.00	1101.52	1002.55	0.610	3.39	1.72	9.288	A
1	East	548.38		137.09			550.33	800.52	86.25	0.00	1171.78	1148.01	0.468	1.41	0.93	6.054	A
2	North	363.19		90.80			363.57	174.59	459.78	0.00	1860.31	964.62	0.195	0.37	0.27	2.655	A
2	West	672.44		168.11			673.29	616.37	206.98	0.00	2043.07	1795.69	0.329	0.74	0.53	2.822	A
2	East	548.38		137.09			548.86	794.77	85.51	0.00	2130.89	2027.83	0.257	0.48	0.36	2.372	A
3	North	363.19	206.77	51.69	156.42	89.00	207.00	85.58	459.88	0.00	1487.91	614.03	0.139	0.23	0.17	3.007	A
3	West	672.44	672.44	168.11	0.00	156.42	673.85	459.88	207.00	0.00	1667.52	1378.41	0.403	1.08	0.73	3.894	A
3	East	548.38	459.38	114.84	89.00	0.00	459.88	795.27	85.58	0.00	1753.76	1690.21	0.262	0.50	0.37	2.924	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	304.15		76.04			304.94	146.54	385.57	0.00	998.55	665.11	0.305	0.69	0.49	5.733	A
1	West	563.13		140.78			565.63	516.91	173.61	0.00	1121.22	1002.55	0.502	1.72	1.10	6.986	A
1	East	459.24		114.81			460.27	667.40	71.84	0.00	1180.12	1148.01	0.389	0.93	0.67	5.215	A
2	North	304.15		76.04			304.39	146.17	384.97	0.00	1914.40	964.62	0.159	0.27	0.21	2.466	A
2	West	563.13		140.78			563.64	516.06	173.29	0.00	2067.43	1795.69	0.272	0.53	0.40	2.572	A
2	East	459.24		114.81			459.55	665.34	71.58	0.00	2140.96	2027.83	0.215	0.36	0.29	2.230	A
3	North	304.15	173.16	43.29	131.00	74.53	173.31	71.62	385.03	0.00	1541.07	614.03	0.112	0.17	0.14	2.818	A
3	West	563.13	563.13	140.78	0.00	131.00	563.90	385.03	173.31	0.00	1691.46	1378.41	0.333	0.73	0.54	3.429	A

3	East	459.24	384.71	96.18	74.53	0.00	385.03	665.59	71.62	0.00	1763.68	1690.21	0.218	0.37	0.29	2.741	A

Queueing Delay Results for each time segment**Queueing Delay results: (08:00-08:15)**

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.93	0.46	5.674	A	A
1	West	15.24	1.02	6.813	A	A
1	East	9.52	0.63	5.160	A	A
2	North	3.07	0.20	2.462	A	A
2	West	5.90	0.39	2.564	A	A
2	East	4.19	0.28	2.227	A	A
3	North	1.99	0.13	2.810	A	A
3	West	7.80	0.52	3.412	A	A
3	East	4.30	0.29	2.735	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.74	0.65	6.678	A	A
1	West	23.46	1.56	8.894	A	A
1	East	13.19	0.88	5.988	A	A
2	North	3.95	0.26	2.651	A	A
2	West	7.75	0.52	2.818	A	A
2	East	5.33	0.36	2.368	A	A
3	North	2.55	0.17	3.004	A	A
3	West	10.60	0.71	3.878	A	A
3	East	5.49	0.37	2.919	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	15.33	1.02	8.718	A	A
1	West	44.83	2.99	14.572	B	B
1	East	20.15	1.34	7.591	A	A
2	North	5.39	0.36	2.959	A	A
2	West	10.91	0.73	3.254	A	A
2	East	7.13	0.48	2.593	A	A
3	North	3.43	0.23	3.314	A	A
3	West	15.74	1.05	4.746	A	A
3	East	7.37	0.49	3.206	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	16.08	1.07	8.797	A	A
1	West	50.28	3.35	15.314	C	B
1	East	21.14	1.41	7.654	A	A
2	North	5.47	0.36	2.960	A	A
2	West	11.13	0.74	3.257	A	A
2	East	7.24	0.48	2.593	A	A
3	North	3.49	0.23	3.315	A	A
3	West	16.23	1.08	4.764	A	A
3	East	7.50	0.50	3.209	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	10.63	0.71	6.745	A	A
1	West	27.46	1.83	9.288	A	A
1	East	14.39	0.96	6.054	A	A
2	North	4.08	0.27	2.655	A	A
2	West	8.07	0.54	2.822	A	A
2	East	5.50	0.37	2.372	A	A
3	North	2.64	0.18	3.007	A	A
3	West	11.21	0.75	3.894	A	A
3	East	5.70	0.38	2.924	A	A

Queueing Delay results: (09:15-09:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	7.50	0.50	5.733	A	A
1	West	17.15	1.14	6.986	A	A
1	East	10.30	0.69	5.215	A	A
2	North	3.17	0.21	2.466	A	A
2	West	6.13	0.41	2.572	A	A
2	East	4.33	0.29	2.230	A	A
3	North	2.06	0.14	2.618	A	A
3	West	6.23	0.55	3.429	A	A
3	East	4.47	0.30	2.741	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.48	-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
1	West	1.07	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.66	-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
2	North	0.21	-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
2	West	0.40	-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
2	East	0.28	-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
3	North	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
3	West	0.53	-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
3	East	0.29	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.67	-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
1	West	1.64	0.00	0.00	3.22	4.29			N/A	N/A
1	East	0.90	0.00	0.00	1.04	1.04			N/A	N/A
2	North	0.27	-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
2	West	0.52	-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
2	East	0.36	-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
3	North	0.17	-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
3	West	0.72	-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
3	East	0.37	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.07	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	3.29	0.00	0.00	2.15	9.66			N/A	N/A
1	East	1.40	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.36	-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
2	West	0.74	-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
2	East	0.48	-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
3	North	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
3	West	1.08	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.50	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

1	North	1.08	0.00	0.00	0.00	1.10			N/A	N/A
1	West	3.39	0.00	0.00	0.00	5.37			N/A	N/A
1	East	1.41	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.37	-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
2	West	0.74	0.00	0.00	0.00	1.07			N/A	N/A
2	East	0.48	0.00	0.00	0.00	1.04			N/A	N/A
3	North	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
3	West	1.08	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.50	0.00	0.00	0.00	1.05			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.69	-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
1	West	1.72	0.00	0.00	3.22	5.37			N/A	N/A
1	East	0.93	0.00	0.00	1.04	1.04			N/A	N/A
2	North	0.27	-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
2	West	0.53	-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
2	East	0.36	-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
3	North	0.17	-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
3	West	0.73	-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
3	East	0.37	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.49	-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
1	West	1.10	0.00	0.00	1.07	3.22			N/A	N/A
1	East	0.67	-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
2	North	0.21	-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
2	West	0.40	-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
2	East	0.29	-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
3	North	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
3	West	0.54	-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
3	East	0.29	-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

Queuing and Blocking Report

Background - 2040
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	26.3	111.4	70.0	33.9	89.9	52.5	57.5	29.6	48.6
Average Queue (m)	12.8	60.8	25.2	11.6	40.6	22.0	23.6	9.4	21.5
95th Queue (m)	22.9	103.6	66.6	26.3	72.8	43.0	45.5	25.4	41.0
Link Distance (m)	902.3			568.8			768.8		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		20.0
Storage Blk Time (%)	28		1		0		3		16
Queuing Penalty (veh)	63		7		0		2		32
									15
									7
									3

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	32.9	36.7	71.2	44.0
Average Queue (m)	16.3	16.3	36.0	23.1
95th Queue (m)	27.3	28.3	66.1	38.4
Link Distance (m)	408.4	523.0	2603.2	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	150.9	39.4	59.1
Average Queue (m)	45.0	12.9	22.5
95th Queue (m)	116.5	30.3	44.8
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 129

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	868	234	64	876	44	191	173	106	46	227	102
Future Volume (vph)	85	868	234	64	876	44	191	173	106	46	227	102
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.993			0.943			0.953	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1348	1597	1054	1401	1340	0	1299	1229	0	1299	1222	0
Flt Permitted	0.087			0.087			0.401			0.462		
Satd. Flow (perm)	123	1597	1054	128	1340	0	548	1229	0	632	1222	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			77		4			41			30	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			2628.2	
Travel Time (s)		67.4			41.9			56.4			189.2	
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	92	943	254	70	952	48	208	188	115	50	247	111
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	943	254	70	1000	0	208	303	0	50	358	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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	
Detector 1 Queue (s)	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	
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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	46.0	46.0	46.0	46.0	46.0		35.3	35.3		35.3	35.3	
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52		0.40	0.40		0.40	0.40	
v/c Ratio	1.46	1.15	0.44	1.06	1.45		0.96	0.59		0.20	0.72	
Control Delay	305.2	103.8	12.1	162.0	231.8		82.2	23.9		20.3	30.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	305.2	103.8	12.1	162.0	231.8		82.2	23.9		20.3	30.2	
LOS	F	F	B	F	F		F	C		C	C	
Approach Delay		100.1			227.3			47.7			29.0	
Approach LOS		F			F			D			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 89.3

Natural Cycle: 145

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.46

Intersection Signal Delay: 124.6

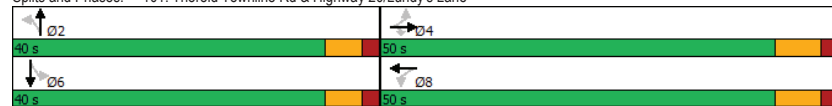
Intersection LOS: F

Intersection Capacity Utilization 135.0%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane



Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	92	943	254	70	1000	208	303	50	358
v/c Ratio	1.46	1.15	0.44	1.06	1.45	0.96	0.59	0.20	0.72
Control Delay	305.2	103.8	12.1	162.0	231.8	82.2	23.9	20.3	30.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	305.2	103.8	12.1	162.0	231.8	82.2	23.9	20.3	30.2
Queue Length 50th (m)	~23.2	~204.6	18.4	~14.3	~253.5	35.8	36.4	5.8	49.0
Queue Length 95th (m)	#43.6	#278.4	38.1	#30.1	#330.2	#81.2	64.5	14.5	84.2
Internal Link Dist (m)		912.7			557.5		759.0		2604.2
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	63	823	580	66	692	221	520	254	510
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.46	1.15	0.44	1.06	1.45	0.94	0.58	0.20	0.70

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.

HCM Signalized Intersection Capacity Analysis
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Background - 2040
PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	85	868	234	64	876	44	191	173	106	46	227	102
Future Volume (vph)	85	868	234	64	876	44	191	173	106	46	227	102
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	1597	1054	1401	1340		1299	1229		1299	1223	
Flt Permitted	0.09	1.00	1.00	0.09	1.00		0.40	1.00		0.46	1.00	
Satd. Flow (perm)	123	1597	1054	128	1340		549	1229		632	1223	
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)	92	943	254	70	952	48	208	188	115	50	247	111
RTOR Reduction (vph)	0	0	37	0	2	0	0	25	0	0	18	0
Lane Group Flow (vph)	92	943	217	70	998	0	208	278	0	50	340	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	43.0	43.0	43.0	43.0	43.0		33.3	33.3		33.3	33.3	
Effective Green, g (s)	46.0	46.0	46.0	46.0	46.0		35.3	35.3		35.3	35.3	
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52		0.40	0.40		0.40	0.40	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	63	822	542	65	690		217	485		249	483	
v/s Ratio Prot		0.59			0.74			0.23			0.28	
v/s Ratio Perm	c0.75		0.21	0.55			c0.38			0.08		
v/c Ratio	1.46	1.15	0.40	1.08	1.45		0.96	0.57		0.20	0.70	
Uniform Delay, d1	21.6	21.6	13.2	21.6	21.6		26.3	21.1		17.7	22.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	275.3	80.3	0.5	134.4	209.0		48.8	1.6		0.4	4.6	
Delay (s)	297.0	102.0	13.7	156.1	230.7		75.1	22.8		18.1	27.2	
Level of Service	F	F	B	F	F		E	C		B	C	
Approach Delay (s)		98.5			225.8			44.1			26.1	
Approach LOS		F			F			D			C	
Intersection Summary												
HCM 2000 Control Delay		122.6			HCM 2000 Level of Service			F				
HCM 2000 Volume to Capacity ratio		1.24										
Actuated Cycle Length (s)		89.3			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		135.0%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

Lanes, Volumes, Timings
102: Thorold Townline Rd & Beaverdams Rd

Background - 2040
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↰			↰			↰	
Traffic Volume (vph)	49	274	53	123	230	36	55	245	94	45	336	90
Future Volume (vph)	49	274	53	123	230	36	55	245	94	45	336	90
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.988			0.968			0.974	
Flt Protected		0.994			0.984			0.993			0.995	
Satd. Flow (prot)	0	1430	0	0	1428	0	0	1345	0	0	1349	0
Flt Permitted		0.994			0.984			0.993			0.995	
Satd. Flow (perm)	0	1430	0	0	1428	0	0	1345	0	0	1349	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2628.2			714.3	
Travel Time (s)		30.1			38.7			189.2			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	53	298	58	134	250	39	60	266	102	49	365	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	409	0	0	423	0	0	428	0	0	512	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			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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 102.1%	ICU Level of Service G											
Analysis Period (min) 15												

HCM Unsignalized Intersection Capacity Analysis
102: Thorold Townline Rd & Beaverdams Rd

Background - 2040
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	49	274	53	123	230	36	55	245	94	45	336	90
Future Volume (vph)	49	274	53	123	230	36	55	245	94	45	336	90
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)	53	298	58	134	250	39	60	266	102	49	365	98
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	409	423	428	512								
Volume Left (vph)	53	134	60	49								
Volume Right (vph)	58	39	102	98								
Hadj (s)	-0.04	0.02	-0.01	0.02								
Departure Headway (s)	9.5	9.6	9.6	9.6								
Degree Utilization, x	1.08	1.13	1.14	1.36								
Capacity (veh/h)	386	387	390	384								
Control Delay (s)	101.6	116.4	119.3	206.1								
Approach Delay (s)	101.6	116.4	119.3	206.1								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay				139.6								
Level of Service				F								
Intersection Capacity Utilization				102.1%	ICU Level of Service			G				
Analysis Period (min)				15								

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Background - 2040
PM Peak Hour

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	196	973	898	265	199	148
Future Volume (vph)	196	973	898	265	199	148
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.969			0.942	
Flt Protected		0.992			0.972	
Satd. Flow (prot)	0	1202	1306	0	1302	0
Flt Permitted		0.992			0.972	
Satd. Flow (perm)	0	1202	1306	0	1302	0
Link Speed (k/h)		50			50	
Link Distance (m)		1017.3			470.3	
Travel Time (s)		73.2			33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	213	1058	976	288	216	161
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1271	1264	0	377	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	
Link Offset(m)		0.0			0.0	
Crosswalk Width(m)		4.8			4.8	
Two way Left Turn Lane						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type: Roundabout						
Intersection Capacity Utilization 218.5%			ICU Level of Service H			
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Background - 2040
PM Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	196	973	898	265	199	148
Future Volume (veh/h)	196	973	898	265	199	148
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	213	1058	976	288	216	161
Approach Volume (veh/h)	1271	1264		377		
Crossing Volume (veh/h)	216	213		976		
High Capacity (veh/h)	1169	1172		635		
High v/c (veh/h)	1.09	1.08		0.59		
Low Capacity (veh/h)	966	968		493		
Low v/c (veh/h)	1.32	1.31		0.76		
Intersection Summary						
Maximum v/c High		1.09				
Maximum v/c Low		1.32				
Intersection Capacity Utilization		218.5%		ICU Level of Service		H

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Background - 2040
PM Peak Hour

Intersection			
Intersection Delay, s/veh	95.0		
Intersection LOS	F		
Approach			
	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1271	1264	377
Demand Flow Rate, veh/h	1288	1302	393
Vehicles Circulating, veh/h	216	219	1005
Vehicles Exiting, veh/h	1182	1285	516
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	100.6	107.3	34.9
Approach LOS	F	F	D
Lane			
	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1288	1302	393
Cap Entry Lane, veh/h	1107	1104	495
Entry HV Adj Factor	0.987	0.971	0.959
Flow Entry, veh/h	1271	1264	377
Cap Entry, veh/h	1093	1071	475
V/C Ratio	1.163	1.180	0.794
Control Delay, s/veh	100.6	107.3	34.9
LOS	F	F	D
95th %tile Queue, veh	36	37	7

Junctions 8									
ARCADY 8 - Roundabout Module									
Version: 8.0.6.541 [19821,26/11/2015] © Copyright TRL Limited, 2023									
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:19:03 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
A1 - BG 2040							
Intersection 1 - Leg North	1.15	?	10.99	0.53	B	286.98	F
Intersection 1 - Leg West	116.82	178.33	361.10	1.19	F		
Intersection 1 - Leg East	96.62	158.62	293.83	1.15	F		
Intersection 2 - Leg North	0.36	~1	3.43	0.26	A	4.77	A
Intersection 2 - Leg West	1.79	2.03	4.99	0.64	A		
Intersection 2 - Leg East	1.75	2.06	4.94	0.63	A		
Intersection 3 - Leg North	0.25	~1	4.05	0.20	A	7.41	A
Intersection 3 - Leg West	3.62	9.12	10.23	0.79	B		
Intersection 3 - Leg East	1.52	1.03	5.56	0.60	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:19:02 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	mph	PCE	PCE	perHour	s	-Min	perMin

(Default Analysis Set) - BG 2040, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
BG 2040, PM	BG 2040	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				286.98	F
2	2	Dual Lane	Roundabout	North,West,East				4.77	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				7.41	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/Unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	347.00	100.000
1	West	ONE HOUR	✓	1184.00	100.000
1	East	ONE HOUR	✓	1168.00	100.000
2	North	ONE HOUR	✓	347.00	100.000

2	West	ONE HOUR	✓	1184.00	100.000
2	East	ONE HOUR	✓	1168.00	100.000
3	North	ONE HOUR	✓	347.00	100.000
3	West	ONE HOUR	✓	1184.00	100.000
3	East	ONE HOUR	✓	1168.00	100.000

Turning Proportions

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

		To		
		North	West	East
From	North	0.000	148.000	199.000
	West	196.000	0.000	988.000
	East	265.000	903.000	0.000

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

		To		
		North	West	East
From	North	0.00	0.43	0.57
	West	0.17	0.00	0.83
	East	0.23	0.77	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

		To		
		North	West	East
From	North	0.000	148.000	199.000
	West	196.000	0.000	988.000
	East	265.000	903.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

		To		
		North	West	East
From	North	0.00	0.43	0.57
	West	0.17	0.00	0.83
	East	0.23	0.77	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

		To		
		North	West	East
From	North	0.000	148.000	199.000
	West	196.000	0.000	988.000
	East	265.000	903.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

		To		
		North	West	East
From	North	0.00	0.43	0.57
	West	0.17	0.00	0.83
	East	0.23	0.77	0.00

Vehicle Mix

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

		To		
		North	West	East
From	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	0.0	10.0	0.0
	West	3.0	0.0	1.0

	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
	North	1.000	1.100	1.000
	West	1.030	1.000	1.010
	East	1.030	1.030	1.000

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
	North	0.0	10.0	0.0
	West	3.0	0.0	1.0
	East	3.0	3.0	0.0

Results

Results Summary for whole modelled period

Intersection	Log	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.53	10.99	1.15	?	B	318.41	477.62	71.80	9.02	0.80	71.81	9.02
1	West	1.19	361.10	116.82	178.33	F	1086.46	1629.69	4923.37	181.26	54.70	4983.65	183.48
1	East	1.15	293.83	96.62	158.62	F	1071.78	1607.67	3952.53	147.51	43.92	3973.51	148.30
2	North	0.26	3.43	0.36	~1	A	318.41	477.62	23.96	3.01	0.27	23.96	3.01
2	West	0.64	4.99	1.79	2.03	A	1086.46	1629.69	107.72	3.97	1.20	107.73	3.97
2	East	0.63	4.94	1.75	2.06	A	1071.78	1607.67	105.88	3.95	1.18	105.88	3.95
3	North	0.20	4.05	0.25	~1	A	318.41	273.91	16.15	3.54	0.18	16.15	3.54
3	West	0.79	10.23	3.62	9.12	B	1086.46	1629.69	188.14	6.93	2.09	188.16	6.93
3	East	0.60	5.56	1.52	1.03	A	1071.78	1242.91	93.66	4.52	1.04	93.67	4.52

Main Results for each time segment

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE/hr)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	261.24		65.31			259.36	341.80	669.96	0.00	834.13	717.22	0.313	0.00	0.47	6.495	A
	West	891.38		222.84			877.59	780.26	148.74	0.00	1135.62	983.65	0.785	0.00	3.45	13.501	B
	East	879.33		219.83			866.18	881.06	145.28	0.00	1137.62	1127.46	0.773	0.00	3.29	13.096	B
2	North	261.24		65.31			260.49	345.89	677.52	0.00	1702.90	1083.77	0.153	0.00	0.19	2.595	A
	West	891.38		222.84			888.37	788.62	149.39	0.00	2084.71	1743.38	0.428	0.00	0.75	3.041	A
	East	879.33		219.83			876.35	890.69	147.06	0.00	2086.39	1984.07	0.421	0.00	0.75	3.056	A
3	North	261.24	149.82	37.45	111.42	199.51	149.31	146.83	677.13	0.00	1333.60	639.33	0.112	0.00	0.13	3.038	A
	West	891.38	891.38	222.84	0.00	111.42	887.00	677.13	149.31	0.00	1708.50	1360.45	0.522	0.00	1.09	4.418	A
	East	879.33	679.83	169.96	199.51	0.00	677.13	889.48	146.83	0.00	1710.26	1654.59	0.398	0.00	0.68	3.580	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE/hr)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS		
1	North	311.95		77.99			310.99	403.74	792.21	0.00	763.20	717.22	0.409	0.47	0.71	8.265	A		
1	West	1064.39		266.10			1034.49	924.85	178.35	0.00	1118.48	983.65	0.952	3.45	10.92	34.785	D		
1	East	1050.01		262.50			1024.69	1041.59	171.25	0.00	1122.59	1127.46	0.935	3.29	9.62	31.675	D		
2	North	311.95		77.99			311.70	413.94	810.82	0.00	1606.53	1083.77	0.194	0.19	0.25	2.892	A		
2	West	1064.39		266.10			1063.12	943.76	178.76	0.00	2063.48	1743.38	0.516	0.75	1.07	3.641	A		
2	East	1050.01		262.50			1048.77	1065.88	175.99	0.00	2065.48	1984.07	0.508	0.75	1.06	3.642	A		
3	North	311.95		178.90		44.72	133.05	238.23			810.70	0.00	1238.73	639.33	0.144	0.13	0.17	3.395	A
3	West	1064.39	1064.39	266.10	0.00	133.05	1061.96	810.70	178.73	0.00	1687.60	1360.45	0.631	1.09	1.70	5.806	A		
3	East	1050.01	811.78	202.94	238.23	0.00	810.70	1064.89	175.80	0.00	1689.69	1654.59	0.480	0.68	0.94	4.213	A		

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE/hr)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	382.05		95.51			380.37	431.86	857.01	0.00	725.70	717.22	0.526	0.71	1.13	10.791	B
	West	1303.61		325.90			1089.52	1019.24	218.14	0.00	1095.45	983.65	1.190	10.92	64.44	135.778	F
	East	1285.99		321.50			1108.51	1127.30	180.38	0.00	1117.32	1127.46	1.151	9.62	53.99	115.205	F
	North	382.05		95.51			381.61	506.48	992.11	0.00	1475.46	1083.77	0.259	0.25	0.36	3.421	A
2	West	1303.61		325.90			1300.77	1154.97	218.85	0.00	2034.50	1743.38	0.641	1.07	1.79	4.953	A
	East	1285.99		321.50			1283.26	1304.29	215.33	0.00	2037.04	1984.07	0.631	1.06	1.74	4.901	A
	North	382.05	219.10	54.78	162.95	291.77	218.80	214.58	991.96	0.00	1109.98	639.33	0.197	0.17	0.24	4.039	A
	West	1303.61	1303.61	325.90	0.00	162.95	1296.26	991.96	218.80	0.00	1659.14	1360.45	0.786	1.70	3.54	9.854	A
3	East	1285.99	994.22	248.56	291.77	0.00	991.96	1300.47	214.58	0.00	1662.14	1654.59	0.598	0.94	1.51	5.514	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE/hr)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	382.05		95.51			381.97	434.20	862.39	0.00	722.59	717.22	0.529	1.13	1.15	10.988	B
	West	1303.61		325.90			1094.11	1025.30	219.05	0.00	1094.92	983.65	1.191	64.44	116.82	304.425	F
	East	1285.99		321.50			1115.47	1132.05	181.12	0.00	1116.88	1127.46	1.151	53.99	96.62	251.470	F
	North	382.05		95.51			382.05	507.55	994.18	0.00	1473.97	1083.77	0.259	0.36	0.36	3.429	A
2	West	1303.61		325.90			1303.55	1157.13	219.10	0.00	2034.31	1743.38	0.641	1.78	1.79	4.991	A
	East	1285.99		321.50			1285.94	1306.86	215.79	0.00	2036.70	1984.07	0.631	1.74	1.75	4.938	A
3	North	382.05	219.10	54.78	162.95	291.77	219.10	215.74	994.17	0.00	1108.41	639.33	0.198	0.24	0.25	4.047	A
	West	1303.61	1303.61	325.90	0.00	162.95	1303.27	994.17	219.10	0.00	1658.93	1360.45	0.786	3.54	3.62	10.229	B
	East	1285.99	994.22	248.56	291.77	0.00	994.17	1306.62	215.74	0.00	1661.31	1654.59	0.598	1.51	1.52	5.557	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE/hr)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	311.95		77.99			313.37	433.86	853.34	0.00	727.82	717.22	0.429	1.15	0.79	9.069	A
	West	1064.39		266.10			1108.08	987.00	179.72	0.00	1117.69	983.65	0.952	116.82	105.90	361.100	F
	East	1050.01		262.50			1103.77	1104.36	183.43	0.00	1115.54	1127.46	0.941	96.62	83.18	293.835	F
2	North	311.95		77.99			312.39	415.51	813.87	0.00	1604.32	1083.77	0.194	0.36	0.25	2.899	A
	West	1064.39		266.10			1067.21	947.11	179.15	0.00	2063.19	1743.38	0.516	1.79	1.09	3.671	A
	East	1050.01		262.50			1052.72	1069.70	176.67	0.00	2064.99	1984.07	0.508	1.75	1.07	3.674	A
3	North	311.95	178.90	44.72	133.05	238.23	179.20	177.43	814.02	0.00	1236.37	639.33	0.145	0.25	0.17	3.408	A
	West	1064.39	1064.39	266.10	0.00	133.05	1071.84	814.02	179.20	0.00	1687.27	1360.45	0.631	3.62	1.76	5.998	A
	East	1050.01	811.78	202.94	238.23	0.00	814.02	1073.61	177.43	0.00	1688.52	1654.59	0.481	1.52	0.96	4.250	A

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE/hr)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	261.24		65.31			262.06	435.72	850.73	0.00	729.33	717.22	0.358	0.79	0.59	8.030	A
	West	891.38	222.84				1123.97	962.50	150.29	0.00	1134.72	983.65	0.786	105.90	47.75	4.945	F
	East	879.33	219.83				1100.39	1088.19	186.06	0.00	1114.02	1127.46	0.789	83.18	27.91	185.394	F
2	North	261.24		65.31			261.49	347.57	680.81	0.00	1700.52	1083.77	0.154	0.25	1.09	2.602	A
	West	891.38	222.84				882.69	792.34	147.96	0.00	2084.30	1743.38	0.429	1.09	0.76	3.068	A
	East	879.33					894.87	884.87	147.96	0.00	2084.30	1743.38	0.429	1.09	0.76	3.068	A
3	West	2124	149.82	37.45	111.42	199.51	149.51	147.90	680.94	0.00	1330.69	639.33	1.113	0.17	0.16	3.044	A
	West	891.38	891.38	222.84	0.00	111.42	893.95	880.94	147.99	0.00	1708.02	1360.45	0.522	1.16	1.12	4.404	A
	East	879.33	679.83	169.96	199.51	0.00	680.94	805.96	149.99	0.00	1709.44	1654.59	0.388	0.96	0.68	3.608	A

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	6.78	0.45	6.495	A	A
1	West	45.64	3.04	13.501	B	B
1	East	43.79	2.92	13.096	B	B
2	North	2.77	0.16	2.595	A	A
2	West	11.02	0.73	3.041	A	A
2	East	10.93	0.73	3.056	A	A
3	North	1.86	0.12	3.038	A	A
3	West	15.84	1.06	4.418	A	A
3	East	9.87	0.66	3.580	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	10.26	0.68	8.265	A	A
1	West	125.07	8.34	34.785	D	C
1	East	113.23	7.55	31.675	D	C
2	North	3.70	0.25	2.892	A	A
2	West	15.70	1.05	3.641	A	A
2	East	15.50	1.03	3.642	A	A
3	North	2.49	0.17	3.395	A	A
3	West	24.57	1.64	5.806	A	A
3	East	13.84	0.92	4.213	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	16.13	1.08	10.791	B	B
1	West	570.27	38.02	135.778	F	F
1	East	483.96	32.26	115.205	F	F
2	North	5.34	0.36	3.421	A	A
2	West	25.74	1.72	4.953	A	A
2	East	25.16	1.68	4.901	A	A
3	North	3.61	0.24	4.039	A	A
3	West	48.85	3.26	9.854	A	A
3	East	21.86	1.46	5.514	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	17.14	1.14	10.988	B	B
1	West	1359.72	90.65	304.425	F	F
1	East	1129.97	75.33	251.470	F	F
2	North	5.44	0.36	3.429	A	A
2	West	26.83	1.79	4.991	A	A
2	East	26.20	1.75	4.938	A	A
3	North	3.68	0.25	4.047	A	A
3	West	53.85	3.59	10.229	B	B
3	East	22.77	1.52	5.557	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	12.38	0.83	9.069	A	A
1	West	1670.34	111.36	361.100	F	F
1	East	1348.44	89.90	293.835	F	F
2	North	3.84	0.26	2.899	A	A
2	West	16.78	1.12	3.671	A	A
2	East	16.55	1.10	3.674	A	A
3	North	2.59	0.17	3.408	A	A
3	West	27.76	1.85	5.998	A	A
3	East	14.84	0.99	4.250	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.11	0.61	8.030	A	A
1	West	1152.33	76.82	248.495	F	F
1	East	833.15	55.54	185.394	F	F
2	North	2.88	0.19	2.602	A	A
2	West	11.65	0.78	3.066	A	A

2	East	11.54	0.77	3.081	A	A
3	North	1.94	0.13	3.048	A	A
3	West	17.27	1.15	4.494	A	A
3	East	10.48	0.70	3.608	A	A

Queue Variation Results for each time segment

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.47	-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
1	West	3.45	0.00	0.00	8.11	11.15			N/A	N/A
1	East	3.29	0.00	1.03	7.21	10.30			N/A	N/A
2	North	0.19	-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
2	West	0.75	-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
2	East	0.75	-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
3	North	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
3	West	1.09	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.68	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.71	-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
1	West	10.92	0.00	5.07	26.34	35.46			N/A	N/A
1	East	9.62	0.00	4.12	22.66	30.90			N/A	N/A
2	North	0.25	-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
2	West	1.07	0.00	0.00	2.03	2.03			N/A	N/A
2	East	1.06	0.00	0.00	1.03	2.06			N/A	N/A
3	North	0.17	-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
3	West	1.70	0.00	0.00	3.04	5.07			N/A	N/A
3	East	0.94	0.00	0.00	1.03	1.03			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.13	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	64.44	29.38	60.80	96.26	108.42			N/A	N/A
1	East	53.99	20.60	49.44	84.46	95.79			N/A	N/A
2	North	0.36	-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
2	West	1.78	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.74	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.24	-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
3	West	3.54	0.00	0.00	1.01	9.12			N/A	N/A
3	East	1.51	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.15	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	116.82	64.85	112.47	162.12	178.33			N/A	N/A
1	East	96.62	46.35	91.67	141.11	158.62			N/A	N/A
2	North	0.36	-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
2	West	1.79	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.75	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.25	-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
3	West	3.62	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

3	East	1.52	?	?	?	?	because the mean queue is very small or very big.	N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.79	~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
1	West	105.90	50.66	100.31	156.04	174.28			N/A	N/A
1	East	83.18	33.99	77.25	128.75	146.26			N/A	N/A
2	North	0.25	~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
2	West	1.09	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.07	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.17	~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
3	West	1.76	0.00	0.00	3.04	5.07			N/A	N/A
3	East	0.96	0.00	0.00	0.00	1.03			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.59	~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
1	West	47.75	19.25	43.57	73.97	84.10			N/A	N/A
1	East	27.91	5.15	22.66	51.50	61.80			N/A	N/A
2	North	0.19	~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
2	West	0.76	0.00	0.00	0.00	1.01			N/A	N/A
2	East	0.76	0.00	0.00	0.00	1.03			N/A	N/A
3	North	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
3	West	1.12	0.00	0.00	2.03	3.04			N/A	N/A
3	East	0.68	~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

Queuing and Blocking Report

Background - 2040
PM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	133.4	253.1	70.0	134.9	585.6	69.9	220.1	38.5	78.5
Average Queue (m)	45.8	129.3	51.9	70.8	551.6	55.3	93.9	10.9	43.0
95th Queue (m)	100.5	221.6	92.4	176.5	667.6	83.0	212.8	26.5	70.7
Link Distance (m)	902.3				568.8	768.8		2603.2	
Upstream Blk Time (%)						82			
Queuing Penalty (veh)						0			
Storage Bay Dist (m)	90.0			20.0	55.0			20.0	
Storage Blk Time (%)	2	45	6			59	76	31	4
Queuing Penalty (veh)	25	145	57			38	213	59	14
								16	

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	109.4	91.5	88.0	326.1
Average Queue (m)	45.4	44.8	50.5	191.0
95th Queue (m)	87.9	87.9	91.0	397.3
Link Distance (m)	408.4	523.0	2603.2	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	1007.2	598.8	61.1
Average Queue (m)	915.3	346.6	21.8
95th Queue (m)	1215.6	771.6	47.4
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)	51	0	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 567

Thorold Townline & Highway 20, Thorold
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Appendix G1

2030 Total Operations Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Future Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0			0.0	20.0		0.0	20.0	0.0
Storage Lanes	1		1	1			0	1		0	1	0
Taper Length (m)	100.0			80.0				50.0			50.0	
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			0.98	1.00								
Frt			0.850		0.972			0.968			0.975	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	1566	973	1287	1285	0	1171	1179	0	836	1152	0
Flt Permitted	0.307			0.225			0.550			0.576		
Satd. Flow (perm)	448	1566	952	305	1285	0	678	1179	0	507	1152	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			65		19			18			14	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			229.0	
Travel Time (s)		67.4			41.9			56.4			16.5	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	68	628	143	45	429	100	107	172	47	177	201	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	68	628	143	45	529	0	107	219	0	177	242	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

Thorold Townline & Highway 20, Thorold
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Lanes, Volumes, Timings

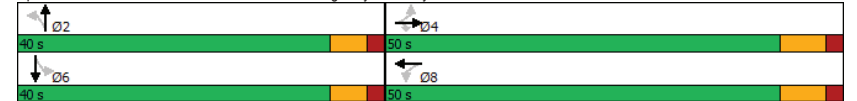
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	38.8	38.8	38.8	38.8	38.8		33.6	33.6		33.6	33.6	
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.48		0.42	0.42		0.42	0.42	
v/c Ratio	0.32	0.84	0.29	0.31	0.84		0.38	0.44		0.84	0.50	
Control Delay	18.0	29.8	9.1	19.9	32.1		23.6	20.3		58.9	22.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.0	29.8	9.1	19.9	32.1		23.6	20.3		58.9	22.2	
LOS	B	C	A	B	C		C	C		E	C	
Approach Delay		25.3			31.1			21.4			37.7	
Approach LOS		C			C			C			D	
Intersection Summary												
Area Type: Other												
Cycle Length: 90												
Actuated Cycle Length: 80.7												
Natural Cycle: 85												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.84												
Intersection Signal Delay: 28.7												
Intersection LOS: C												
Intersection Capacity Utilization 92.5%												
ICU Level of Service F												
Analysis Period (min) 15												

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	68	628	143	45	529	107	219	177	242
v/c Ratio	0.32	0.84	0.29	0.31	0.84	0.38	0.44	0.84	0.50
Control Delay	18.0	29.8	9.1	19.9	32.1	23.6	20.3	58.9	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.0	29.8	9.1	19.9	32.1	23.6	20.3	58.9	22.2
Queue Length 50th (m)	6.8	88.6	7.2	4.5	72.8	12.8	24.6	27.4	28.8
Queue Length 95th (m)	17.0	138.0	18.6	13.3	#135.3	29.0	47.1	#69.8	54.4
Internal Link Dist (m)		912.7			557.5		759.0		205.0
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	263	922	587	179	765	312	553	233	538
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.68	0.24	0.25	0.69	0.34	0.40	0.76	0.45

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Future Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	1566	952	1287	1284		1171	1178		836	1151	
Flt Permitted	0.31	1.00	1.00	0.22	1.00		0.55	1.00		0.58	1.00	
Satd. Flow (perm)	448	1566	952	305	1284		677	1178		506	1151	
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)	68	628	143	45	429	100	107	172	47	177	201	41
RTOR Reduction (vph)	0	0	34	0	10	0	0	10	0	0	8	0
Lane Group Flow (vph)	68	628	109	45	519	0	107	209	0	177	234	0
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	35.7	35.7	35.7	35.7	35.7		31.6	31.6		31.6	31.6	
Effective Green, g (s)	38.7	38.7	38.7	38.7	38.7		33.6	33.6		33.6	33.6	
Actuated g/C Ratio	0.48	0.48	0.48	0.48	0.48		0.42	0.42		0.42	0.42	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	215	754	458	146	618		283	492		211	481	
v/s Ratio Prot		0.40			c0.40			0.18			0.20	
v/s Ratio Perm	0.15		0.11	0.15			0.16			c0.35		
v/c Ratio	0.32	0.83	0.24	0.31	0.84		0.38	0.42		0.84	0.49	
Uniform Delay, d1	12.7	18.0	12.2	12.7	18.1		16.1	16.5		20.9	17.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	7.8	0.3	1.2	10.0		0.8	0.6		24.2	0.8	
Delay (s)	13.6	25.8	12.4	13.9	28.1		17.0	17.1		45.2	17.8	
Level of Service	B	C	B	B	C		B	B		D	B	
Approach Delay (s)		22.6			27.0			17.1			29.4	
Approach LOS		C			C			B			C	

Intersection Summary

HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	80.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	92.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
Future Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.999			0.960			0.980	
Flt Protected		0.989			0.982			0.996			0.997	
Satd. Flow (prot)	0	1393	0	0	1436	0	0	1302	0	0	1190	0
Flt Permitted		0.989			0.982			0.996			0.997	
Satd. Flow (perm)	0	1393	0	0	1436	0	0	1302	0	0	1190	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2099.4			714.3	
Travel Time (s)		30.1			38.7			151.2			51.4	
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	42	112	34	110	179	3	38	330	153	16	197	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	188	0	0	292	0	0	521	0	0	250	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	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 82.8% ICU Level of Service E

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
Future Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
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)	42	112	34	110	179	3	38	330	153	16	197	37
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	188	292	521	250								
Volume Left (vph)	42	110	38	16								
Volume Right (vph)	34	3	153	37								
Hadj (s)	-0.02	0.09	-0.01	0.29								
Departure Headway (s)	7.4	7.2	6.3	7.3								
Degree Utilization, x	0.39	0.58	0.92	0.50								
Capacity (veh/h)	449	478	556	462								
Control Delay (s)	15.1	19.7	45.5	17.5								
Approach Delay (s)	15.1	19.7	45.5	17.5								
Approach LOS	C	C	E	C								
Intersection Summary												
Delay		29.3										
Level of Service		D										
Intersection Capacity Utilization		82.8%		ICU Level of Service					E			
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2030
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	149	552	437	94	222	306
Future Volume (vph)	149	552	437	94	222	306
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.976		0.922	
Flt Protected		0.989			0.979	
Satd. Flow (prot)	0	1107	1301	0	1199	0
Flt Permitted		0.989			0.979	
Satd. Flow (perm)	0	1107	1301	0	1199	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	162	600	475	102	241	333
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	762	577	0	574	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	146.8%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2030
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	149	552	437	94	222	306
Future Volume (veh/h)	149	552	437	94	222	306
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	162	600	475	102	241	333
Approach Volume (veh/h)		762	577		574	
Crossing Volume (veh/h)		241	162		475	
High Capacity (veh/h)		1147	1220		952	
High v/c (veh/h)		0.66	0.47		0.60	
Low Capacity (veh/h)		945	1012		771	
Low v/c (veh/h)		0.81	0.57		0.74	
Intersection Summary						
Maximum v/c High	0.66					
Maximum v/c Low	0.81					
Intersection Capacity Utilization	146.8%			ICU Level of Service H		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2030
AM Peak Hour

Intersection			
Intersection Delay, s/veh	17.9		
Intersection LOS	C		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	762	577	574
Demand Flow Rate, veh/h	836	601	641
Vehicles Circulating, veh/h	258	206	499
Vehicles Exiting, veh/h	882	888	308
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	19.9	9.9	23.2
Approach LOS	C	A	C
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	836	601	641
Cap Entry Lane, veh/h	1061	1118	829
Entry HV Adj Factor	0.911	0.960	0.895
Flow Entry, veh/h	762	577	574
Cap Entry, veh/h	967	1074	743
V/C Ratio	0.788	0.537	0.773
Control Delay, s/veh	19.9	9.9	23.2
LOS	C	A	C
95th %tile Queue, veh	8	3	8

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2030
AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	71	91	64	263	179	39
Future Volume (vph)	71	91	64	263	179	39
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.924				0.976	
Fit Protected	0.979			0.990		
Satd. Flow (prot)	1315	0	0	1192	1328	0
Fit Permitted	0.979			0.990		
Satd. Flow (perm)	1315	0	0	1192	1328	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	288.9			148.9	150.9	
Travel Time (s)	20.8			10.7	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	99	70	286	195	42
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	0	356	237	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	65.2%			ICU Level of Service C		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2030
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	71	91	64	263	179	39
Future Volume (Veh/h)	71	91	64	263	179	39
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)	77	99	70	286	195	42
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				378		
pX, platoon unblocked						
vC, conflicting volume	642	216	237			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	642	216	237			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	88	95			
cM capacity (veh/h)	415	824	1330			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	176	356	237			
Volume Left	77	70	0			
Volume Right	99	0	42			
cSH	576	1330	1700			
Volume to Capacity	0.31	0.05	0.14			
Queue Length 95th (m)	10.3	1.3	0.0			
Control Delay (s)	14.0	1.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.0	1.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		4.1				
Intersection Capacity Utilization		65.2%		ICU Level of Service	C	
Analysis Period (min)		15				

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2030
AM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	4	8	3	331	201	1
Future Volume (vph)	4	8	3	331	201	1
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.907				0.999	
Flt Protected	0.985					
Satd. Flow (prot)	1299	0	0	1204	1359	0
Flt Permitted	0.985					
Satd. Flow (perm)	1299	0	0	1204	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.4			150.9	2099.4	
Travel Time (s)	11.0			10.9	151.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	9	3	360	218	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	13	0	0	363	219	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	40.7%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2030
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	8	3	331	201	1
Future Volume (Veh/h)	4	8	3	331	201	1
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)	4	9	3	360	218	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	584	218	219			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	584	218	219			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	473	821	1350			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	13	363	219			
Volume Left	4	3	0			
Volume Right	9	0	1			
cSH	669	1350	1700			
Volume to Capacity	0.02	0.00	0.13			
Queue Length 95th (m)	0.5	0.1	0.0			
Control Delay (s)	10.5	0.1	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.5	0.1	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.3				
Intersection Capacity Utilization		40.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2030
AM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	48	138	34	279	248	22
Future Volume (vph)	48	138	34	279	248	22
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900				0.989	
Flt Protected	0.987			0.995		
Satd. Flow (prot)	1292	0	0	1198	1346	0
Flt Permitted	0.987			0.995		
Satd. Flow (perm)	1292	0	0	1198	1346	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	208.4			229.0	148.9	
Travel Time (s)	15.0			16.5	10.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	150	37	303	270	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	202	0	0	340	294	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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 69.6%	ICU Level of Service C					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
203: Thorold Townline Rd & Street CTotal - 2030
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	48	138	34	279	248	22
Future Volume (Veh/h)	48	138	34	279	248	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)	52	150	37	303	270	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (m)			229			
pX, platoon unblocked						
vC, conflicting volume	659	282	294			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	659	282	294			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	80	97			
cM capacity (veh/h)	416	757	1268			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	202	340	294			
Volume Left	52	37	0			
Volume Right	150	0	24			
cSH	625	1268	1700			
Volume to Capacity	0.32	0.03	0.17			
Queue Length 95th (m)	11.2	0.7	0.0			
Control Delay (s)	13.5	1.1	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.5	1.1	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.7				
Intersection Capacity Utilization		69.6%	ICU Level of Service	C		
Analysis Period (min)		15				

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Junctions 8
ARCADY 8 - Roundabout Module
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Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:11:20 PM

Summary of intersection performance

	AM						Intersection Delay (s)	Intersection LOS
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS			
A1 - TT 2030								
Intersection 1 - Leg North	1.76	1.11	11.08	0.62	B	10.46	B	
Intersection 1 - Leg West	2.66	5.45	12.68	0.71	B			
Intersection 1 - Leg East	1.11	?	6.91	0.52	A			
Intersection 2 - Leg North	0.51	1.11	3.18	0.32	A	2.97	A	
Intersection 2 - Leg West	0.67	1.09	3.15	0.38	A			
Intersection 2 - Leg East	0.41	~1	2.51	0.28	A			
Intersection 3 - Leg North	0.21	~1	3.13	0.17	A	3.68	A	
Intersection 3 - Leg West	0.96	~1	4.51	0.47	A			
Intersection 3 - Leg East	0.41	~1	3.11	0.28	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:11:19 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

file:///C:/Users/AdamMorrison/OneDrive%20-%20Paradigm/Desktop/Projects/210565%... 2023-11-22

(Default Analysis Set) - TT 2030, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
TT 2030, AM	TT 2030	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				10.46	B
2	2	Dual Lane	Roundabout	North,West,East				2.97	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				3.68	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width	E - Entry width	F - Effective flare length	R - Entry radius	D - Inscribed circle diameter	PHI - Conflict (entry) angle	Exit

		(m)	(m)	(m)	(m)	(m)	(deg)	Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	528.00	100.000
1	West	ONE HOUR	✓	701.00	100.000

1	East	ONE HOUR	✓	531.00	100.000
2	North	ONE HOUR	✓	528.00	100.000
2	West	ONE HOUR	✓	701.00	100.000
2	East	ONE HOUR	✓	531.00	100.000
3	North	ONE HOUR	✓	528.00	100.000
3	West	ONE HOUR	✓	701.00	100.000
3	East	ONE HOUR	✓	531.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
North	0.000	306.000	222.000	
West	149.000	0.000	552.000	
East	94.000	437.000	0.000	

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

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.21	0.00	0.79	
East	0.18	0.82	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.000	306.000	222.000	
West	149.000	0.000	552.000	
East	94.000	437.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.21	0.00	0.79	
East	0.18	0.82	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.000	306.000	222.000	
West	149.000	0.000	552.000	
East	94.000	437.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.21	0.00	0.79	
East	0.18	0.82	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 1 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.62	11.08	1.76	1.11	B	484.50	726.75	102.46	8.46	1.14	102.48	8.46
1	West	0.71	12.68	2.66	5.45	B	643.25	964.87	148.21	9.22	1.65	148.24	9.22
1	East	0.52	6.91	1.11	?	A	487.25	730.88	71.49	5.87	0.79	71.50	5.87
2	North	0.32	3.18	0.51	1.11	A	484.50	726.75	34.80	2.87	0.39	34.80	2.87
2	West	0.38	3.15	0.67	1.09	A	643.25	964.87	45.72	2.84	0.51	45.72	2.84
2	East	0.28	2.51	0.41	~1	A	487.25	730.88	28.63	2.35	0.32	28.63	2.35
3	North	0.17	3.13	0.21	~1	A	484.50	305.57	14.91	2.93	0.17	14.91	2.93
3	West	0.47	4.51	0.96	~1	A	643.25	964.87	63.00	3.92	0.70	63.01	3.92
3	East	0.28	3.11	0.41	~1	A	487.25	601.50	29.01	2.89	0.32	29.01	2.89

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	397.51		99.38			394.74	181.75	327.20	0.00	1032.33	701.38	0.385	0.00	0.69	6.270	A
1	West	527.75		131.94			523.95	555.98	165.97	0.00	1125.64	1051.02	0.469	0.00	0.95	6.483	A
1	East	399.76		99.94			397.59	578.56	111.37	0.00	1157.25	1092.41	0.345	0.00	0.54	4.918	A
2	North	397.51		99.38			396.37	182.46	328.20	0.00	1955.44	1059.15	0.203	0.00	0.28	2.573	A
2	West	527.75		131.94			526.27	557.91	166.66	0.00	2072.23	1870.76	0.255	0.00	0.37	2.536	A
2	East	399.76		99.94			398.80	581.06	111.86	0.00	2111.84	1905.24	0.189	0.00	0.24	2.186	A
3	North	397.51	167.13	41.78	230.37	70.77	166.63	111.76	328.02	0.00	1581.57	669.32	0.106	0.00	0.13	2.722	A
3	West	527.75	527.75	131.94	0.00	230.37	525.79	328.02	166.63	0.00	1696.20	1339.15	0.311	0.00	0.49	3.347	A

3	East	399.76	329.00	82.25	70.77	0.00	328.02	580.66	111.76	0.00	1735.17	1612.38	0.190	0.00	0.24	2.685	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	474.66		118.67			473.42	217.92	392.22	0.00	994.70	701.38	0.477	0.69	1.00	7.681	A
1	West	630.18		157.55			628.33	666.59	199.05	0.00	1106.50	1051.02	0.570	0.95	1.41	8.174	A
1	East	477.36		119.34			476.59	693.82	133.55	0.00	1144.41	1092.41	0.417	0.54	0.74	5.602	A
2	North	474.66		118.67			474.32	218.31	392.64	0.00	1908.85	1059.15	0.249	0.28	0.37	2.798	A
2	West	630.18		157.55			629.74	667.54	199.43	0.00	2048.53	1870.76	0.308	0.37	0.48	2.766	A
2	East	477.36		119.34			477.10	695.32	133.85	0.00	2095.94	1905.24	0.228	0.24	0.31	2.314	A
3	North	474.66	199.57	49.89	275.09	84.50	199.44	133.81	392.59	0.00	1535.70	669.32	0.130	0.13	0.16	2.882	A
3	West	630.18	630.18	157.55	0.00	275.09	629.53	392.59	199.44	0.00	1672.89	1339.15	0.377	0.49	0.65	3.759	A
3	East	477.36	392.85	98.21	84.50	0.00	392.59	695.16	133.81	0.00	1719.51	1612.38	0.228	0.24	0.31	2.848	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	581.34		145.33			578.41	266.28	479.94	0.00	943.93	701.38	0.616	1.00	1.73	10.891	B
1	West	771.82		192.95			767.06	815.15	243.19	0.00	1089.95	1051.02	0.714	1.41	2.60	12.315	B
1	East	584.64		146.16			583.17	847.22	163.04	0.00	1127.34	1092.41	0.519	0.74	1.10	6.868	A
2	North	581.34		145.33			580.77	267.31	480.81	0.00	1845.11	1059.15	0.315	0.37	0.51	3.172	A
2	West	771.82		192.95			771.05	817.39	244.19	0.00	2016.18	1870.76	0.383	0.48	0.67	3.150	A
2	East	584.64		146.16			584.24	851.35	163.89	0.00	2074.23	1905.24	0.282	0.31	0.41	2.514	A
3	North	581.34	244.43	61.11	336.91	103.50	244.22	163.79	480.73	0.00	1473.10	669.32	0.166	0.16	0.21	3.134	A
3	West	771.82	771.82	192.95	0.00	336.91	770.60	480.73	244.22	0.00	1641.09	1339.15	0.470	0.65	0.96	4.501	A
3	East	584.64	481.15	120.29	103.50	0.00	480.73	851.02	163.79	0.00	1698.21	1612.38	0.283	0.31	0.41	3.105	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	581.34		145.33			581.23	267.49	481.12	0.00	943.25	701.38	0.616	1.73	1.76	11.080	B
1	West	771.82		192.95			771.57	817.96	244.38	0.00	1080.26	1051.02	0.714	2.60	2.66	12.685	B
1	East	584.64		146.16			584.61	851.95	164.00	0.00	1126.78	1092.41	0.519	1.10	1.11	6.910	A
2	North	581.34		145.33			581.33	267.55	481.14	0.00	1844.87	1059.15	0.315	0.51	0.51	3.175	A
2	West	771.82		192.95			771.81	818.05	244.42	0.00	2016.00	1870.76	0.383	0.67	0.67	3.153	A
2	East	584.64		146.16			584.64	852.18	164.05	0.00	2074.11	1905.24	0.282	0.41	0.41	2.515	A
3	North	581.34	244.43	61.11	336.91	103.50	244.42	164.05	481.14	0.00	1472.81	669.32	0.166	0.21	0.21	3.135	A
3	West	771.82	771.82	192.95	0.00	336.91	771.80	481.14	244.42	0.00	1640.94	1339.15	0.470	0.96	0.96	4.515	A
3	East	584.64	481.15	120.29	103.50	0.00	481.14	852.17	164.05	0.00	1698.03	1612.38	0.283	0.41	0.41	3.105	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	474.66		118.67			477.57	219.72	394.04	0.00	993.65	701.38	0.478	1.76	1.04	7.820	A
1	West	630.18		157.55			634.93	670.81	200.80	0.00	1105.49	1051.02	0.570	2.66	1.48	8.423	A
1	East	477.36		119.34			478.80	700.77	134.96	0.00	1143.59	1092.41	0.417	1.11	0.75	5.649	A
2	North	474.66		118.67			475.23	218.68	393.18	0.00	1908.46	1059.15	0.249	0.51	0.37	2.801	A
2	West	630.18		157.55			630.94	668.60	199.81	0.00	2048.26	1870.76	0.308	0.67	0.49	2.772	A
2	East	477.36		119.34			477.76	696.64	134.11	0.00	2095.76	1905.24	0.228	0.41	0.31	2.315	A
3	North	474.66	199.57	49.89	275.09	84.50	199.78	134.20	393.26	0.00	1535.23	669.32	0.130	0.21	0.16	2.884	A
3	West	630.18	630.18	157.55	0.00	275.09	631.39	393.26	199.78	0.00	1672.65	1339.15	0.377	0.96	0.66	3.775	A
3	East	477.36	392.85	98.21	84.50	0.00	393.26	696.96	134.20	0.00	1719.23	1612.38	0.229	0.41	0.31	2.851	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	397.51		99.38			398.82	183.51	329.65	0.00	1030.91	701.38	0.386	1.04	0.71	6.365	A
1	West	527.75		131.94			529.74	560.79	167.69	0.00	1124.65	1051.02	0.469	1.48	0.98	6.620	A
1	East	399.76		99.94			400.56	584.83	112.60	0.00	1156.53	1092.41	0.346	0.75	0.55	4.963	A
2	North	397.51		99.38			397.85	183.08	329.21	0.00	1964.71	1059.15	0.203	0.37	0.29	2.580	A
2	West	527.75		131.94			528.20	559.78	167.28	0.00	2071.78	1870.76	0.255	0.49	0.37	2.544	A
2	East	399.76		99.94			400.02	583.21	112.27	0.00	2111.54	1905.24	0.189	0.31	0.24	2.190	A
3	North	397.51	167.13	41.78	230.37	70.77	167.27	112.32	329.26	0.00	1580.68	669.32	0.106	0.16	0.13	2.725	A
3	West	527.75	527.75	131.94	0.00	230.37	528.42	329.26	167.27	0.00	1695.74	1339.15	0.311	0.66	0.50	3.363	A

3	East	399.76	329.00	82.25	70.77	0.00	329.26	583.37	112.32	0.00	1734.77	1612.38	0.190	0.31	0.25	2.689	A

Queueing Delay Results for each time segment**Queueing Delay results: (08:00-08:15)**

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.96	0.66	6.270	A	A
1	West	13.63	0.91	6.483	A	A
1	East	7.92	0.53	4.918	A	A
2	North	4.18	0.28	2.573	A	A
2	West	5.47	0.36	2.536	A	A
2	East	3.58	0.24	2.186	A	A
3	North	1.86	0.12	2.722	A	A
3	West	7.18	0.48	3.347	A	A
3	East	3.61	0.24	2.685	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	14.51	0.97	7.681	A	A
1	West	20.34	1.34	8.174	A	A
1	East	10.78	0.72	5.602	A	A
2	North	5.44	0.36	2.798	A	A
2	West	7.14	0.48	2.766	A	A
2	East	4.54	0.30	2.314	A	A
3	North	2.36	0.16	2.882	A	A
3	West	9.64	0.64	3.759	A	A
3	East	4.59	0.31	2.848	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	24.55	1.64	10.891	B	B
1	West	36.18	2.41	12.315	B	B
1	East	15.99	1.07	6.868	A	A
2	North	7.53	0.50	3.172	A	A
2	West	9.92	0.66	3.150	A	A
2	East	6.03	0.40	2.514	A	A
3	North	3.14	0.21	3.134	A	A
3	West	14.03	0.94	4.501	A	A
3	East	6.11	0.41	3.105	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	26.28	1.75	11.080	B	B
1	West	39.58	2.64	12.685	B	B
1	East	16.65	1.11	6.910	A	A
2	North	7.67	0.51	3.175	A	A
2	West	10.10	0.67	3.153	A	A
2	East	6.11	0.41	2.515	A	A
3	North	3.18	0.21	3.135	A	A
3	West	14.43	0.96	4.515	A	A
3	East	6.21	0.41	3.105	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	16.22	1.08	7.820	A	A
1	West	23.30	1.55	8.423	A	A
1	East	11.64	0.78	5.649	A	A
2	North	5.64	0.38	2.801	A	A
2	West	7.41	0.49	2.772	A	A
2	East	4.68	0.31	2.315	A	A
3	North	2.44	0.16	2.884	A	A
3	West	10.16	0.68	3.775	A	A
3	East	4.75	0.32	2.851	A	A

Queueing Delay results: (09:15-09:30)</

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	10.94	0.73	6.365	A	A
1	West	15.18	1.01	6.620	A	A
1	East	8.51	0.57	4.963	A	A
2	North	4.34	0.29	2.580	A	A
2	West	5.68	0.38	2.544	A	A
2	East	3.70	0.25	2.190	A	A
3	North	1.93	0.13	2.725	A	A
3	West	7.56	0.50	3.363	A	A
3	East	3.74	0.25	2.689	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.69	-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
1	West	0.95	-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
1	East	0.54	-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
2	North	0.28	-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
2	West	0.37	-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
2	East	0.24	-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
3	North	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
3	West	0.49	-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
3	East	0.24	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.00	0.00	0.00	1.11	1.11			N/A	N/A
1	West	1.41	0.00	0.00	2.18	3.27			N/A	N/A
1	East	0.74	-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
2	North	0.37	-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
2	West	0.48	-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
2	East	0.31	-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
3	North	0.16	-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
3	West	0.65	-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
3	East	0.31	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.73	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	2.60	0.00	0.00	0.00	5.45			N/A	N/A
1	East	1.10	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.51	-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
2	West	0.67	-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
2	East	0.41	-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
3	North	0.21	-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
3	West	0.96	-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
3	East	0.41	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker

1	North	1.76	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	2.66	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	1.11	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.51	0.00	0.00	0.00	1.11			N/A	N/A
2	West	0.67	0.00	0.00	0.00	1.09			N/A	N/A
2	East	0.41	-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
3	North	0.21	-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
3	West	0.96	-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
3	East	0.41	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.04	0.00	0.00	1.11	1.11			N/A	N/A
1	West	1.48	0.00	0.00	2.18	3.27			N/A	N/A
1	East	0.75	-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
2	North	0.37	-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
2	West	0.49	-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
2	East	0.31	-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
3	North	0.16	-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
3	West	0.66	-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
3	East	0.31	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.71	0.00	0.00	0.00	1.11			N/A	N/A
1	West	0.98	0.00	0.00	1.09	2.18			N/A	N/A
1	East	0.55	-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
2	North	0.29	-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
2	West	0.37	-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
2	East	0.24	-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
3	North	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
3	West	0.50	-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
3	East	0.25	-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

Queuing and Blocking Report

Total - 2030
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	38.8	119.9	69.9	26.5	106.8	50.1	64.6	69.8	158.8
Average Queue (m)	15.7	64.9	23.9	8.7	52.5	19.6	26.6	52.9	59.2
95th Queue (m)	32.2	104.8	63.0	20.4	91.4	38.8	50.7	81.0	133.6
Link Distance (m)	902.3			568.8			768.8		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		
Storage Blk Time (%)	35		2		8		13		22
Queuing Penalty (veh)	68		13		3		27		13
							123		37

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	25.8	29.7	88.7	47.3
Average Queue (m)	14.2	15.2	37.5	20.7
95th Queue (m)	22.8	25.5	73.2	35.8
Link Distance (m)	410.2	524.9	2077.4	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	84.3	43.9	98.6
Average Queue (m)	28.6	16.7	36.6
95th Queue (m)	61.4	36.2	75.5
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

Total - 2030
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Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	26.0	22.1	2.6
Average Queue (m)	13.1	4.3	0.1
95th Queue (m)	21.0	14.5	1.3
Link Distance (m)	280.2	132.0	133.9
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	9.2	6.9
Average Queue (m)	2.3	0.2
95th Queue (m)	8.5	3.0
Link Distance (m)	144.8	133.9
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	27.6	21.7	1.2
Average Queue (m)	14.1	2.7	0.0
95th Queue (m)	23.4	12.1	0.9
Link Distance (m)	198.0	209.5	132.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 284

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Future Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.970			0.960			0.960		
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1348	1597	1054	1401	1315	0	1299	1246	0	1299	1233	0
Flt Permitted	0.087			0.127			0.361			0.384		
Satd. Flow (perm)	123	1597	1054	187	1315	0	494	1246	0	525	1233	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			74		20			24			24	
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	936.7			581.5			783.0			217.0		
Travel Time (s)	67.4			41.9			56.4			15.6		
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	87	821	213	58	841	207	173	265	95	159	279	101
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	821	213	58	1048	0	173	360	0	159	380	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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	
Detector 1 Queue (s)	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	
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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
Page 1

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	46.2	46.2	46.2	46.2	46.2		32.2	32.2		32.2	32.2	
Actuated g/C Ratio	0.53	0.53	0.53	0.53	0.53		0.37	0.37		0.37	0.37	
v/c Ratio	1.34	0.96	0.36	0.59	1.47		0.95	0.75		0.82	0.80	
Control Delay	252.3	45.4	10.2	44.7	242.3		82.6	32.9		56.9	36.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	252.3	45.4	10.2	44.7	242.3		82.6	32.9		56.9	36.8	
LOS	F	D	B	D	F		F	C		E	D	
Approach Delay		54.8			231.9			49.0			42.7	
Approach LOS		D			F			D			D	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 86.4

Natural Cycle: 105

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.47

Intersection Signal Delay: 111.3

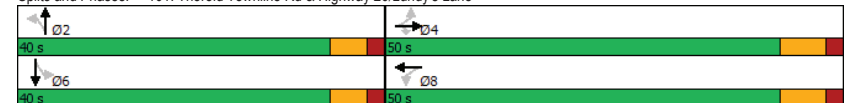
Intersection LOS: F

Intersection Capacity Utilization 131.4%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

PM Peak Hour

	↖	→	↗	↙	←	↘	↑	↖	↓
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	821	213	58	1048	173	360	159	380
v/c Ratio	1.34	0.96	0.36	0.59	1.47	0.95	0.75	0.82	0.80
Control Delay	252.3	45.4	10.2	44.7	242.3	82.6	32.9	56.9	36.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	252.3	45.4	10.2	44.7	242.3	82.6	32.9	56.9	36.8
Queue Length 50th (m)	~21.3	~144.5	13.5	7.1	~271.7	28.4	50.0	24.3	54.5
Queue Length 95th (m)	#40.9	#229.0	29.9	#28.8	#349.5	#68.9	84.6	#59.7	#101.0
Internal Link Dist (m)		912.7			557.5		759.0		193.0
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	65	854	597	99	712	206	535	219	529
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.34	0.96	0.36	0.59	1.47	0.84	0.67	0.73	0.72

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.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Future Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	1597	1054	1401	1315		1299	1246		1299	1233	
Flt Permitted	0.09	1.00	1.00	0.13	1.00		0.36	1.00		0.38	1.00	
Satd. Flow (perm)	123	1597	1054	188	1315		494	1246		525	1233	
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)	87	821	213	58	841	207	173	265	95	159	279	101
RTOR Reduction (vph)	0	0	34	0	9	0	0	15	0	0	15	0
Lane Group Flow (vph)	87	821	179	58	1039	0	173	345	0	159	365	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	43.2	43.2	43.2	43.2	43.2		30.2	30.2		30.2	30.2	
Effective Green, g (s)	46.2	46.2	46.2	46.2	46.2		32.2	32.2		32.2	32.2	
Actuated g/C Ratio	0.53	0.53	0.53	0.53	0.53		0.37	0.37		0.37	0.37	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	65	853	563	100	703		184	464		195	459	
v/s Ratio Prot		0.51			c0.79			0.28			0.30	
v/s Ratio Perm	0.71		0.17	0.31			c0.35			0.30		
v/c Ratio	1.34	0.96	0.32	0.58	1.48		0.94	0.74		0.82	0.80	
Uniform Delay, d1	20.1	19.3	11.3	13.6	20.1		26.2	23.5		24.4	24.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	226.1	22.0	0.3	7.9	222.5		49.2	6.3		22.4	9.2	
Delay (s)	246.2	41.3	11.6	21.5	242.6		75.3	29.9		46.8	33.4	
Level of Service	F	D	B	C	F		E	C		D	C	
Approach Delay (s)		51.5			231.0			44.6			37.3	
Approach LOS		D			F			D			D	

Intersection Summary

HCM 2000 Control Delay	108.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	86.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	131.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
Future Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.980			0.990			0.958			0.978	
Flt Protected		0.993			0.978			0.995			0.996	
Satd. Flow (prot)	0	1427	0	0	1425	0	0	1339	0	0	1356	0
Flt Permitted		0.993			0.978			0.995			0.996	
Satd. Flow (perm)	0	1427	0	0	1425	0	0	1339	0	0	1356	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2106.3			714.3	
Travel Time (s)		30.1			38.7			151.7			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	45	246	50	199	208	33	50	285	150	40	389	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	341	0	0	440	0	0	485	0	0	511	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	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 104.7% ICU Level of Service G

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
Future Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
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)	45	246	50	199	208	33	50	285	150	40	389	82
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	341	440	485	511								
Volume Left (vph)	45	199	50	40								
Volume Right (vph)	50	33	150	82								
Hadj (s)	-0.04	0.06	-0.07	0.03								
Departure Headway (s)	9.5	9.4	9.2	9.3								
Degree Utilization, x	0.90	1.15	1.25	1.33								
Capacity (veh/h)	369	392	395	393								
Control Delay (s)	56.4	121.9	158.2	190.5								
Approach Delay (s)	56.4	121.9	158.2	190.5								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay		139.0										
Level of Service		F										
Intersection Capacity Utilization		104.7%		ICU Level of Service					G			
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2030
PM Peak Hour

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	355	843	770	256	188	257
Future Volume (vph)	355	843	770	256	188	257
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.966		0.922	
Flt Protected		0.985			0.979	
Satd. Flow (prot)	0	1191	1302	0	1266	0
Flt Permitted		0.985			0.979	
Satd. Flow (perm)	0	1191	1302	0	1266	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	386	916	837	278	204	279
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1302	1115	0	483	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	219.4%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2030
PM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	355	843	770	256	188	257
Future Volume (veh/h)	355	843	770	256	188	257
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	386	916	837	278	204	279
Approach Volume (veh/h)		1302	1115		483	
Crossing Volume (veh/h)		204	386		837	
High Capacity (veh/h)		1180	1022		711	
High v/c (veh/h)		1.10	1.09		0.68	
Low Capacity (veh/h)		976	834		559	
Low v/c (veh/h)		1.33	1.34		0.86	
Intersection Summary						
Maximum v/c High	1.10					
Maximum v/c Low	1.34					
Intersection Capacity Utilization	219.4%		ICU Level of Service		H	

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2030
PM Peak Hour

Intersection			
Intersection Delay, s/veh	108.6		
Intersection LOS	F		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1302	1115	483
Demand Flow Rate, veh/h	1323	1148	511
Vehicles Circulating, veh/h	204	398	862
Vehicles Exiting, veh/h	1169	1129	684
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	107.1	138.4	43.9
Approach LOS	F	F	E
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1323	1148	511
Cap Entry Lane, veh/h	1121	919	573
Entry HV Adj Factor	0.984	0.971	0.945
Flow Entry, veh/h	1302	1115	483
Cap Entry, veh/h	1103	893	541
V/C Ratio	1.181	1.249	0.892
Control Delay, s/veh	107.1	138.4	43.9
LOS	F	F	E
95th %tile Queue, veh	38	39	10

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2030
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	82	103	189	281	384	69
Future Volume (vph)	82	103	189	281	384	69
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.925				0.979	
Flt Protected	0.978			0.980		
Satd. Flow (prot)	1315	0	0	1180	1332	0
Flt Permitted	0.978			0.980		
Satd. Flow (perm)	1315	0	0	1180	1332	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	304.3			152.9	152.0	
Travel Time (s)	21.9			11.0	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	112	205	305	417	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	201	0	0	510	492	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	96.4%			ICU Level of Service F		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2030
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	82	103	189	281	384	69
Future Volume (Veh/h)	82	103	189	281	384	69
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)	89	112	205	305	417	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				370		
pX, platoon unblocked						
vC, conflicting volume	1170	454	492			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1170	454	492			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	48	82	81			
cM capacity (veh/h)	173	606	1071			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	201	510	492			
Volume Left	89	205	0			
Volume Right	112	0	75			
cSH	287	1071	1700			
Volume to Capacity	0.70	0.19	0.29			
Queue Length 95th (m)	38.7	5.6	0.0			
Control Delay (s)	42.4	5.0	0.0			
Lane LOS	E	A				
Approach Delay (s)	42.4	5.0	0.0			
Approach LOS	E					
Intersection Summary						
Average Delay		9.2				
Intersection Capacity Utilization		96.4%		ICU Level of Service	F	
Analysis Period (min)		15				

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2030
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (vph)	3	5	9	354	448	4
Future Volume (vph)	3	5	9	354	448	4
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916				0.999	
Flt Protected	0.982			0.999		
Satd. Flow (prot)	1308	0	0	1203	1359	0
Flt Permitted	0.982			0.999		
Satd. Flow (perm)	1308	0	0	1203	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	79.3			152.0	2106.3	
Travel Time (s)	5.7			10.9	151.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	5	10	385	487	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	0	395	491	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 50.0%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2030
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	3	5	9	354	448	4
Future Volume (Veh/h)	3	5	9	354	448	4
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)	3	5	10	385	487	4
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	894	489	491			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	894	489	491			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	309	579	1072			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	8	395	491			
Volume Left	3	10	0			
Volume Right	5	0	4			
cSH	436	1072	1700			
Volume to Capacity	0.02	0.01	0.29			
Queue Length 95th (m)	0.4	0.2	0.0			
Control Delay (s)	13.4	0.3	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.4	0.3	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		0.3				
Intersection Capacity Utilization		50.0%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2030
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (vph)	38	107	83	432	389	98
Future Volume (vph)	38	107	83	432	389	98
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900				0.973	
Flt Protected	0.987			0.992		
Satd. Flow (prot)	1292	0	0	1194	1324	0
Flt Permitted	0.987			0.992		
Satd. Flow (perm)	1292	0	0	1194	1324	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	214.7			217.0	152.9	
Travel Time (s)	15.5			15.6	11.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	116	90	470	423	107
Shared Lane Traffic (%)						
Lane Group Flow (vph)	157	0	0	560	530	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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 99.6%	ICU Level of Service F					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis 203: Thorold Townline Rd & Street C

Total - 2030
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	38	107	83	432	389	98
Future Volume (Veh/h)	38	107	83	432	389	98
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)	41	116	90	470	423	107
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (m)			217			
pX, platoon unblocked						
vC, conflicting volume	1126	476	530			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1126	476	530			
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	80	91			
cM capacity (veh/h)	207	589	1037			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	157	560	530			
Volume Left	41	90	0			
Volume Right	116	0	107			
cSH	397	1037	1700			
Volume to Capacity	0.40	0.09	0.31			
Queue Length 95th (m)	14.8	2.3	0.0			
Control Delay (s)	19.9	2.3	0.0			
Lane LOS	C	A				
Approach Delay (s)	19.9	2.3	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		3.5				
Intersection Capacity Utilization		99.6%		ICU Level of Service	F	
Analysis Period (min)		15				

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
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Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821.26/11/2015]

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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:10:47 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
A1 - TT 2030							
Intersection 1 - Leg North	1.77	2.11	13.30	0.63	B		
Intersection 1 - Leg West	121.51	183.87	376.96	1.20	F	239.21	F
Intersection 1 - Leg East	60.01	117.42	176.35	1.09	F		
Intersection 2 - Leg North	0.47	1.06	3.48	0.31	A		
Intersection 2 - Leg West	1.84	2.03	5.05	0.65	A	4.67	A
Intersection 2 - Leg East	1.48	1.03	4.75	0.59	A		
Intersection 3 - Leg North	0.21	~1	3.58	0.17	A		
Intersection 3 - Leg West	3.74	9.14	10.45	0.79	B	7.36	A
Intersection 3 - Leg East	1.26	1.03	5.38	0.55	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:10:46 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	km/h	PCE	PCE	perHour	s	-Min	perMin

file:///C:/Users/AdamMorrison/OneDrive%20-%20Paradigm/Desktop/Projects/210565%... 2023-11-22

(Default Analysis Set) - TT 2030, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
TT 2030, PM	TT 2030	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				239.21	F
2	2	Dual Lane	Roundabout	North,West,East				4.67	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				7.36	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope (calculated)	Entered intercept (PCE/hr) (calculated)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	445.00	100.000
1	West	ONE HOUR	✓	1198.00	100.000
1	East	ONE HOUR	✓	1026.00	100.000
2	North	ONE HOUR	✓	445.00	100.000

2	West	ONE HOUR	✓	1198.00	100.000
2	East	ONE HOUR	✓	1026.00	100.000
3	North	ONE HOUR	✓	445.00	100.000
3	West	ONE HOUR	✓	1198.00	100.000
3	East	ONE HOUR	✓	1026.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
	0.000	257.000	188.000	
West	355.000	0.000	843.000	
East	256.000	770.000	0.000	

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

From	To			
	North	West	East	
	0.00	0.58	0.42	
West	0.30	0.00	0.70	
East	0.25	0.75	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
	0.000	257.000	188.000	
West	355.000	0.000	843.000	
East	256.000	770.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
	0.00	0.58	0.42	
West	0.30	0.00	0.70	
East	0.25	0.75	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
	0.000	257.000	188.000	
West	355.000	0.000	843.000	
East	256.000	770.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
	0.00	0.58	0.42	
West	0.30	0.00	0.70	
East	0.25	0.75	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 1 (for whole period)

From	To			
	North	West	East	
	0.0	10.0	0.0	
West	3.0	0.0	1.0	

	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
	0.0	10.0	0.0	
West	3.0	0.0	1.0	
East	3.0	3.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
	0.0	10.0	0.0	
West	3.0	0.0	1.0	
East	3.0	3.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Log	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.63	13.30	1.77	2.11	B	408.34	612.51	102.58	10.05	1.14	102.60	10.05
1	West	1.20	376.96	121.51	183.87	F	1099.31	1648.96	5198.64	189.16	57.76	5279.61	192.11
1	East	1.09	176.35	60.01	117.42	F	941.48	1412.21	2082.41	88.47	23.14	2082.77	88.49
2	North	0.31	3.48	0.47	1.06	A	408.34	612.51	31.21	3.06	0.35	31.21	3.06
2	West	0.65	5.05	1.84	2.03	A	1099.31	1648.96	110.00	4.00	1.22	110.01	4.00
2	East	0.59	4.75	1.48	1.03	A	941.48	1412.21	90.42	3.84	1.00	90.43	3.84
3	North	0.17	3.58	0.21	~1	A	408.34	258.77	13.86	3.21	0.15	13.86	3.21
3	West	0.79	10.45	3.74	9.14	B	1099.31	1648.96	193.28	7.03	2.15	193.30	7.03
3	East	0.55	5.38	1.26	1.03	A	941.48	1059.85	77.99	4.42	0.87	78.00	4.42

Main Results for each time segment

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	335.02		83.75			332.50	453.21	572.03	0.00	899.63	768.07	0.376	0.00	0.63	6.778	A
1	West	901.92		225.48			897.65	764.96	140.47	0.00	1140.40	1033.90	0.791	0.00	3.57	13.785	B
1	East	772.43		193.11			762.21	765.09	263.03	0.00	1069.47	1044.38	0.722	0.00	2.56	11.711	B
2	North	335.02		83.75			334.04	458.44	577.76	0.00	1775.02	1214.76	0.189	0.00	0.24	2.635	A
2	West	901.92		225.48			898.85	770.68	141.12	0.00	2090.69	1821.69	0.431	0.00	0.77	3.061	A
2	East	772.43		193.11			769.85	773.62	266.35	0.00	2000.15	1802.45	0.386	0.00	0.64	3.007	A
3	North	335.02	141.54	35.38	193.48	192.73	141.09	265.94	577.43	0.00	1404.42	720.48	0.101	0.00	0.11	2.850	A
3	West	901.92	901.92	225.48	0.00	193.48	897.45	577.43	141.09	0.00	1714.34	1302.81	0.526	0.00	1.12	4.453	A
3	East	772.43	579.70	144.92	192.73	0.00	577.43	772.60	265.94	0.00	1625.66	1540.34	0.357	0.00	0.57	3.530	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	400.05		100.01			398.68	535.92	680.65	0.00	827.77	768.07	0.483	0.63	0.97	8.827	A
1	West	1076.98	269.24				1044.87	910.90	168.43	0.00	1124.22	1033.90	0.958	3.57	11.59	36.203	E
1	East	922.35	230.59				906.95	903.68	309.62	0.00	1042.50	1044.38	0.885	2.56	6.41	24.871	C
2	North	400.05		100.01			399.72	548.63	691.43	0.00	1692.84	1214.76	0.236	0.24	0.33	2.938	A
2	West	1076.98	269.24				1075.67	922.28	168.87	0.00	2070.62	1821.69	0.520	0.77	1.09	3.670	A
2	East	922.35	230.59				921.30	925.79	318.75	0.00	1962.27	1802.45	0.470	0.64	0.91	3.559	A
3	North	400.05	169.01	42.25	231.04	230.14	168.87	318.40	691.33	0.00	1323.52	720.48	0.128	0.11	0.15	3.117	A
3	West	1076.98	1076.98	269.24	0.00	231.04	1074.48	691.33	168.87	0.00	1694.60	1302.81	0.636	1.12	1.74	5.874	A
3	East	922.35	692.21	173.05	230.14	0.00	691.33	924.95	318.40	0.00	1588.40	1540.34	0.436	0.57	0.79	4.129	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	489.95		122.49			486.96	578.63	762.49	0.00	780.40	768.07	0.628	0.97	1.72	12.814	B
1	West	1319.02	329.76				1097.18	1043.72	205.73	0.00	1102.63	1033.90	1.196	11.59	67.06	140.150	F
1	East	1129.65	282.41				1015.99	877.78	325.12	0.00	1033.53	1044.38	1.093	6.41	34.82	86.435	F
2	North	489.95	122.49				489.37	671.30	846.09	0.00	1581.03	1214.76	0.310	0.33	0.47	3.478	A
2	West	1319.02	329.76				1316.10	1128.72	206.74	0.00	2043.24	1821.69	0.646	1.08	1.82	5.009	A
2	East	1129.65	282.41				1127.99	1132.85	390.00	0.00	1910.76	1802.45	0.591	0.91	1.47	4.720	A
3	North	489.95	206.99	51.75	282.96	281.86	206.76	388.60	845.95	0.00	1213.69	720.48	0.171	0.15	0.20	3.575	A
3	West	1319.02	1319.02	329.76	0.00	282.96	1311.38	845.95	206.76	0.00	1667.70	1302.81	0.791	1.74	3.65	10.051	B
3	East	1129.65	847.79	211.95	281.86	0.00	845.95	1129.54	388.60	0.00	1538.54	1540.34	0.551	0.79	1.25	5.340	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	489.95		122.49			489.73	583.04	772.17	0.00	774.80	768.07	0.632	1.72	1.77	13.304	B
1	West	1319.02	329.76				1101.22	1055.00	206.90	0.00	1101.96	1033.90	1.197	67.06	121.51	314.320	F
1	East	1129.65	282.41				1028.90	981.79	326.32	0.00	1032.84	1044.38	1.094	34.82	60.01	176.353	F
2	North	489.95	122.49				489.95	672.70	847.76	0.00	1579.83	1214.76	0.310	0.47	0.47	3.485	A
2	West	1319.02	329.76				1318.97	1130.71	206.99	0.00	2043.07	1821.69	0.646	1.82	1.84	5.050	A
2	East	1129.65	282.41				1129.61	1135.11	390.85	0.00	1910.15	1802.45	0.591	1.47	1.48	4.750	A
3	North	489.95	206.99	51.75	282.96	281.86	206.99	390.75	847.75	0.00	1212.41	720.48	0.171	0.20	0.21	3.579	A
3	West	1319.02	1319.02	329.76	0.00	282.96	1318.66	847.75	206.99	0.00	1667.53	1302.81	0.791	3.65	3.74	10.451	B
3	East	1129.65	847.79	211.95	281.86	0.00	847.75	1134.89	390.75	0.00	1537.01	1540.34	0.552	1.25	1.26	5.379	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	400.05		100.01			402.62	582.91	760.44	0.00	781.59	768.07	0.512	1.77	1.13	10.094	B
1	West	1076.98	269.24				1113.94	992.97	170.09	0.00	1123.26	1033.90	0.959	121.51	112.27	376.958	F
1	East	922.35	230.59				1013.26	953.95	330.09	0.00	1030.66	1044.38	0.895	60.01	37.28	175.186	F
2	North	400.05		100.01			400.62	550.70	693.90	0.00	1691.06	1214.76	0.237	0.47	0.33	2.947	A
2	West	1076.98	269.24				1079.88	925.27	169.25	0.00	2070.35	1821.69	0.520	1.84	1.11	3.704	A
2	East	922.35	230.59				924.59	929.13	320.00	0.00	1961.37	1802.45	0.470	1.48	0.92	3.586	A
3	North	400.05	169.01	42.25	231.04	230.14	169.24	321.44	694.03	0.00	1321.59	720.48	0.128	0.21	0.15	3.126	A
3	West	1076.98	1076.98	269.24	0.00	231.04	1084.74	694.03	169.24	0.00	1694.34	1302.81	0.636	3.74	1.80	6.072	A
3	East	922.35	692.21	173.05	230.14	0.00	694.03	932.54	321.44	0.00	1586.24	1540.34	0.436	1.26	0.80	4.165	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	335.02		83.75			336.63	561.08	681.19	0.00	827.45	768.07	0.405	1.13	0.73	7.766	A
1	West	901.92	225.48				1129.17	875.60	142.22	0.00	1139.39	1033.90	0.792	112.27	55.45	269.495	F
1	East	772.43	193.11				907.67	936.79	334.61	0.00	1028.04	1044.38	0.751	37.28	3.47	52.930	F
2	North	335.02		83.75			335.35	460.66	580.50	0.00	1773.03	1214.76	0.189	0.33	0.25	2.642	A
2	West	901.92	225.48				903.26	774.18	141.67	0.00	2090.29	1821.69	0.431	1.11	0.78	3.083	A
2	East	772.43	193.11				773.50	777.27	287.86	0.00	1999.21	1802.45	0.386	0.92	0.65	3.027	A
3	North	335.02	141.54	35.38	193.48	192.73	141.67	286.05	580.61	0.00	1402.15	720.48	0.101	0.15	0.11	2.857	A
3	West	901.92	901.92	225.48	0.00	193.48	904.57	580.61	141.67	0.00	1713.92	1302.81	0.526	1.80	1.14	4.532	A
3	East	772.43	579.70	144.92	192.73	0.00	580.61	778.20	286.05	0.00	1624.16	1540.34	0.357	0.80	0.58	3.558	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.05	0.05	6.778	A	A
1	West	47.08	3.14	13.785	B	B
1	East	34.72	2.31	11.711	B	B
2	North	3.61	0.24	2.635	A	A
2	West	11.22	0.75	3.061	A	A
2	East	9.45	0.63	3.007	A	A
3	North	1.65	0.11	2.850	A	A
3	West	16.15	1.08	4.453	A	A
3	East	8.30	0.55	3.530	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	13.97	0.93	8.827	A	A
1	West	131.33	8.76	36.203	E	D
1	East	80.32	5.35	24.871	C	C
2	North	4.81	0.32	2.938	A	A
2	West	16.01	1.07	3.670	A	A
2	East	13.33	0.89	3.559	A	A
3	North	2.16	0.14	3.117	A	A
3	West	25.12	1.67	5.874	A	A
3	East	11.59	0.77	4.129	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	24.12	1.61	12.814	B	B
1	West	594.53	39.64	140.150	F	F
1	East	320.92	21.39	86.435	F	F
2	North	6.95	0.46	3.478	A	A
2	West	26.33	1.76	5.009	A	A
2	East	21.36	1.42	4.720	A	A
3	North	3.02	0.20	3.575	A	A
3	West	50.31	3.35	10.051	B	B
3	East	18.12	1.21	5.340	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	26.30	1.75	13.304	B	B
1	West	1414.49	94.30	314.320	F	F
1	East	712.32	47.49	176.353	F	F
2	North	7.09	0.47	3.485	A	A
2	West	27.46	1.83	5.050	A	A
2	East	22.16	1.48	4.750	A	A
3	North	3.08	0.21	3.579	A	A
3	West	55.61	3.71	10.451	B	B
3	East	18.81	1.25	5.379	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	17.81	1.19	10.094	B	B
1	West	1753.31	116.89	376.958	F	F
1	East	729.67	48.64	175.186	F	F
2	North	5.00	0.33	2.947	A	A
2	West	17.12	1.14	3.704	A	A
2	East	14.16	0.94	3.586	A	A
3	North	2.24	0.15	3.126	A	A
3	West	28.46	1.90	6.072	A	A
3	East	12.37	0.82	4.165	A	A

2	East	9.96		0.66		3.027		A		A
3	North	1.71		0.11		2.857		A		A
3	West	17.63		1.18		4.532		A		A
3	East	8.79		0.59		3.558		A		A

Queue Variation Results for each time segment

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.63	~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
1	West	3.57	0.00	0.00	8.13	12.19			N/A	N/A
1	East	2.56	0.00	1.03	4.12	5.15			N/A	N/A
2	North	0.24	~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
2	West	0.77	~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
2	East	0.64	~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
3	North	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
3	West	1.12	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.57	~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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.97	0.00	0.00	1.06	1.06			N/A	N/A
1	West	11.59	0.00	6.10	27.43	37.59			N/A	N/A
1	East	6.41	0.00	2.06	15.45	21.63			N/A	N/A
2	North	0.33	~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
2	West	1.09	0.00	0.00	2.03	2.03			N/A	N/A
2	East	0.91	0.00	0.00	1.03	1.03			N/A	N/A
3	North	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
3	West	1.74	0.00	0.00	3.05	5.08			N/A	N/A
3	East	0.79	0.00	0.00	0.00	1.03			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.72	0.00	0.00	0.00	2.11			N/A	N/A
1	West	67.06	31.49	62.98	99.55	111.74			N/A	N/A
1	East	34.82	8.24	29.87	60.77	73.13			N/A	N/A
2	North	0.47	~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
2	West	1.82	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.47	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.20	~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
3	West	3.65	0.00	0.00	1.02	9.14			N/A	N/A
3	East	1.25	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.77	0.00	0.00	0.00	2.11			N/A	N/A
1	West	121.51	69.08	116.82	167.62	163.87			N/A	N/A
1	East	60.01	18.54	53.56	100.94	117.42			N/A	N/A
2	North	0.47	0.00	0.00	0.00	1.06			N/A	N/A
2	West	1.84	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.48	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.21	~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
3	West	3.74	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	1.26	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.13	0.00	0.00	1.06	2.11			N/A	N/A
1	West	112.27	54.86	106.66	163.55	162.85			N/A	N/A
1	East	37.28	10.30	32.96	63.86	75.19			N/A	N/A
2	North	0.33	~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
2	West	1.11	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	0.92	~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
3	North	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
3	West	1.80	0.00	0.00	4.06	5.08			N/A	N/A
3	East	0.80	~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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.73	0.00	0.00	1.06	1.06			N/A	N/A
1	West	55.45	20.32	50.79	87.36	100.57			N/A	N/A
1	East	3.47	0.00	0.00	3.09	11.33			N/A	N/A
2	North	0.25	~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
2	West	0.78	0.00	0.00	0.00	1.02			N/A	N/A
2	East	0.65	~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
3	North	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
3	West	1.14	0.00	0.00	2.03	3.05			N/A	N/A
3	East	0.58	~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

Queuing and Blocking Report

Total - 2030
PM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	104.6	129.0	70.0	135.0	584.5	69.9	327.8	69.9	184.3
Average Queue (m)	51.5	72.6	35.0	71.1	572.2	52.1	127.4	53.8	107.9
95th Queue (m)	101.0	110.7	79.0	177.7	618.7	83.0	333.5	84.6	216.6
Link Distance (m)	902.3			568.8			768.8		
Upstream Blk Time (%)				95			12		
Queuing Penalty (veh)				0			59		
Storage Bay Dist (m)	90.0		20.0	55.0		20.0		20.0	
Storage Blk Time (%)	8	38	3		60	70	38	70	39
Queuing Penalty (veh)	80	104	27		32	232	61	246	57

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	60.7	112.8	120.7	217.2
Average Queue (m)	27.2	52.8	49.8	108.1
95th Queue (m)	49.9	117.6	100.5	219.7
Link Distance (m)	410.2	524.9	2084.4	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	1010.0	388.9	69.5
Average Queue (m)	906.0	213.6	25.7
95th Queue (m)	1238.4	464.8	52.5
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)	54		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

Total - 2030
PM Peak Hour

Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	78.4	44.5	46.1
Average Queue (m)	26.9	15.9	9.8
95th Queue (m)	75.6	33.3	63.0
Link Distance (m)	295.6	135.8	134.9
Upstream Blk Time (%)	3		
Queuing Penalty (veh)	14		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	8.8	14.4	99.1
Average Queue (m)	1.8	1.1	13.7
95th Queue (m)	7.5	7.6	129.3
Link Distance (m)	70.5	134.9	2084.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	93.6	55.2	101.6
Average Queue (m)	27.3	11.0	21.8
95th Queue (m)	88.8	35.7	95.6
Link Distance (m)	204.4	197.7	135.8
Upstream Blk Time (%)	1		5
Queuing Penalty (veh)	0		25
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 936

Appendix G2

2035 Total Operations Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖
Traffic Volume (vph)	67	615	144	46	424	94	107	171	47	164	194	39
Future Volume (vph)	67	615	144	46	424	94	107	171	47	164	194	39
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0			0.0	20.0		0.0	20.0	0.0
Storage Lanes	1		1	1			0	1		0	1	0
Taper Length (m)	100.0			80.0			50.0			50.0		
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			0.98	1.00								
Frt			0.850		0.973			0.968			0.975	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	1566	973	1287	1286	0	1171	1179	0	836	1152	0
Flt Permitted	0.284			0.200			0.532			0.550		
Satd. Flow (perm)	415	1566	952	271	1286	0	656	1179	0	484	1152	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			67		18			18			13	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			229.0	
Travel Time (s)		67.4			41.9			56.4			16.5	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	73	668	157	50	461	102	116	186	51	178	211	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	73	668	157	50	563	0	116	237	0	178	253	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
Page 1

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

AM Peak Hour

	↖	→	↗	↖	←	↖	↖	↖	↖	↖	↖	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	41.1	41.1	41.1	41.1	41.1		34.6	34.6		34.6	34.6	
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49		0.41	0.41		0.41	0.41	
v/c Ratio	0.36	0.87	0.31	0.38	0.88		0.43	0.48		0.89	0.52	
Control Delay	19.5	33.1	9.4	23.5	36.0		25.6	21.7		70.1	23.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.5	33.1	9.4	23.5	36.0		25.6	21.7		70.1	23.6	
LOS	B	C	A	C	D		C	C		E	C	
Approach Delay		27.9			35.0			23.0			42.8	
Approach LOS		C			C			C			D	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 83.8

Natural Cycle: 85

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 31.8

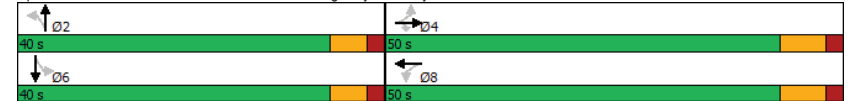
Intersection LOS: C

Intersection Capacity Utilization 96.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
Page 2

Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	73	668	157	50	563	116	237	178	253
v/c Ratio	0.36	0.87	0.31	0.38	0.88	0.43	0.48	0.89	0.52
Control Delay	19.5	33.1	9.4	23.5	36.0	25.6	21.7	70.1	23.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	33.1	9.4	23.5	36.0	25.6	21.7	70.1	23.6
Queue Length 50th (m)	7.5	98.5	8.4	5.2	81.5	15.0	29.0	30.1	32.6
Queue Length 95th (m)	19.0	#169.4	20.9	16.1	#150.2	31.8	51.5	#72.0	57.2
Internal Link Dist (m)	912.7		557.5		759.0		205.0		
Turn Bay Length (m)	90.0	20.0		55.0	20.0		20.0		
Base Capacity (vph)	231	873	560	151	725	286	524	211	510
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.77	0.28	0.33	0.78	0.41	0.45	0.84	0.50

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	615	144	46	424	94	107	171	47	164	194	39
Future Volume (vph)	67	615	144	46	424	94	107	171	47	164	194	39
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	1566	952	1287	1286		1171	1178		836	1152	
Flt Permitted	0.28	1.00	1.00	0.20	1.00		0.53	1.00		0.55	1.00	
Satd. Flow (perm)	415	1566	952	271	1286		656	1178		484	1152	
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)	73	668	157	50	461	102	116	186	51	178	211	42
RTOR Reduction (vph)	0	0	34	0	9	0	0	11	0	0	8	0
Lane Group Flow (vph)	73	668	123	50	554	0	116	226	0	178	245	0
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	4				8		2				6	
Permitted Phases	4		4		8		2				6	
Actuated Green, G (s)	38.1	38.1	38.1	38.1	38.1		32.5	32.5		32.5	32.5	
Effective Green, g (s)	41.1	41.1	41.1	41.1	41.1		34.5	34.5		34.5	34.5	
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49		0.41	0.41		0.41	0.41	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	204	769	468	133	632		270	486		199	475	
v/s Ratio Prot	0.43				c0.43		0.19				0.21	
v/s Ratio Perm	0.18	0.13		0.18			0.18			c0.37		
v/c Ratio	0.36	0.87	0.26	0.38	0.88		0.43	0.47		0.89	0.52	
Uniform Delay, d1	13.1	18.9	12.4	13.3	19.0		17.5	17.9		22.9	18.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	10.2	0.3	1.8	13.0		1.1	0.7		36.0	1.0	
Delay (s)	14.2	29.1	12.7	15.0	31.9		18.6	18.6		58.8	19.3	
Level of Service	B	C	B	B	C		B	B		E	B	
Approach Delay (s)	25.0				30.6		18.6				35.6	
Approach LOS	C				C		B				D	
Intersection Summary												
HCM 2000 Control Delay			27.5		HCM 2000 Level of Service		C					
HCM 2000 Volume to Capacity ratio			0.88									
Actuated Cycle Length (s)			83.6		Sum of lost time (s)		8.0					
Intersection Capacity Utilization			96.1%		ICU Level of Service		F					
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2035

AM Peak Hour

	↖	→	↘	↙	←	↖	↙	↗	↘	↖	↘	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	43	112	34	105	182	4	39	320	141	16	192	38
Future Volume (vph)	43	112	34	105	182	4	39	320	141	16	192	38
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.998			0.962			0.979	
Flt Protected		0.989			0.982			0.996			0.997	
Satd. Flow (prot)	0	1393	0	0	1433	0	0	1304	0	0	1190	0
Flt Permitted		0.989			0.982			0.996			0.997	
Satd. Flow (perm)	0	1393	0	0	1433	0	0	1304	0	0	1190	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2099.4			714.3	
Travel Time (s)		30.1			38.7			151.2			51.4	
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	47	122	37	114	198	4	42	348	153	17	209	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	206	0	0	316	0	0	543	0	0	267	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	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 87.2%

ICU Level of Service E

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Total - 2035

AM Peak Hour

	↖	→	↘	↙	←	↖	↙	↗	↘	↖	↘	↗
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	43	112	34	105	182	4	39	320	141	16	192	38
Future Volume (vph)	43	112	34	105	182	4	39	320	141	16	192	38
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)	47	122	37	114	198	4	42	348	153	17	209	41
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	206	316	543	267								
Volume Left (vph)	47	114	42	17								
Volume Right (vph)	37	4	153	41								
Hadj (s)	-0.02	0.09	0.00	0.29								
Departure Headway (s)	7.8	7.5	6.8	7.6								
Degree Utilization, x	0.45	0.65	1.02	0.57								
Capacity (veh/h)	435	468	543	448								
Control Delay (s)	16.9	23.5	71.2	20.2								
Approach Delay (s)	16.9	23.5	71.2	20.2								
Approach LOS	C	C	F	C								
Intersection Summary												
Delay			41.2									
Level of Service			E									
Intersection Capacity Utilization			87.2%									
Analysis Period (min)			15									

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2035
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	153	600	473	97	226	310
Future Volume (vph)	153	600	473	97	226	310
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.977		0.922	
Flt Protected		0.990			0.979	
Satd. Flow (prot)	0	1111	1302	0	1199	0
Flt Permitted		0.990			0.979	
Satd. Flow (perm)	0	1111	1302	0	1199	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	166	652	514	105	246	337
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	818	619	0	583	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	154.5%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2035
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	153	600	473	97	226	310
Future Volume (veh/h)	153	600	473	97	226	310
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	166	652	514	105	246	337
Approach Volume (veh/h)		818	619		583	
Crossing Volume (veh/h)		246	166		514	
High Capacity (veh/h)		1142	1216		923	
High v/c (veh/h)		0.72	0.51		0.63	
Low Capacity (veh/h)		941	1008		745	
Low v/c (veh/h)		0.87	0.61		0.78	
Intersection Summary						
Maximum v/c High	0.72					
Maximum v/c Low	0.87					
Intersection Capacity Utilization	154.5%			ICU Level of Service H		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2035
AM Peak Hour

Intersection			
Intersection Delay, s/veh	21.4		
Intersection LOS	C		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	818	619	583
Demand Flow Rate, veh/h	896	645	651
Vehicles Circulating, veh/h	263	211	540
Vehicles Exiting, veh/h	928	948	316
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	24.8	10.8	27.7
Approach LOS	C	B	D
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	896	645	651
Cap Entry Lane, veh/h	1055	1113	796
Entry HV Adj Factor	0.913	0.960	0.896
Flow Entry, veh/h	818	619	583
Cap Entry, veh/h	964	1068	712
V/C Ratio	0.849	0.580	0.818
Control Delay, s/veh	24.8	10.8	27.7
LOS	C	B	D
95th %tile Queue, veh	11	4	9

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2035
AM Peak Hour

	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (vph)	71	91	64	282	190	30
Future Volume (vph)	71	91	64	282	190	30
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.924				0.981	
Flt Protected	0.979			0.991		
Satd. Flow (prot)	1315	0	0	1193	1335	0
Flt Permitted	0.979			0.991		
Satd. Flow (perm)	1315	0	0	1193	1335	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	288.9			148.9	150.9	
Travel Time (s)	20.8			10.7	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	99	70	307	207	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	0	377	240	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 66.8%	ICU Level of Service C					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2035
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	71	91	64	282	190	30
Future Volume (Veh/h)	71	91	64	282	190	30
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)	77	99	70	307	207	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				378		
pX, platoon unblocked						
vC, conflicting volume	670	224	240			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	670	224	240			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	88	95			
cM capacity (veh/h)	400	816	1327			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	176	377	240			
Volume Left	77	70	0			
Volume Right	99	0	33			
cSH	561	1327	1700			
Volume to Capacity	0.31	0.05	0.14			
Queue Length 95th (m)	10.7	1.3	0.0			
Control Delay (s)	14.3	1.9	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.3	1.9	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			4.1			
Intersection Capacity Utilization			66.8%	ICU Level of Service	C	
Analysis Period (min)			15			

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2035
AM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	4	8	3	350	212	1
Future Volume (vph)	4	8	3	350	212	1
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.907				0.999	
Flt Protected	0.985					
Satd. Flow (prot)	1299	0	0	1204	1359	0
Flt Permitted	0.985					
Satd. Flow (perm)	1299	0	0	1204	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.4			150.9	2099.4	
Travel Time (s)	11.0			10.9	151.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	9	3	380	230	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	13	0	0	383	231	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 42.2%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2035
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	8	3	350	212	1
Future Volume (Veh/h)	4	8	3	350	212	1
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)	4	9	3	380	230	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	616	230	231			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	616	230	231			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	453	809	1337			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	13	383	231			
Volume Left	4	3	0			
Volume Right	9	0	1			
cSH	651	1337	1700			
Volume to Capacity	0.02	0.00	0.14			
Queue Length 95th (m)	0.5	0.1	0.0			
Control Delay (s)	10.6	0.1	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.6	0.1	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization		42.2%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2035
AM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	48	138	34	298	259	22
Future Volume (vph)	48	138	34	298	259	22
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900				0.989	
Flt Protected	0.987			0.995		
Satd. Flow (prot)	1292	0	0	1198	1346	0
Flt Permitted	0.987			0.995		
Satd. Flow (perm)	1292	0	0	1198	1346	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	208.4			229.0	148.9	
Travel Time (s)	15.0			16.5	10.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	150	37	324	282	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	202	0	0	361	306	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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 72.0%	ICU Level of Service C					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis 203: Thorold Townline Rd & Street C

Total - 2035
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	48	138	34	298	259	22
Future Volume (Veh/h)	48	138	34	298	259	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)	52	150	37	324	282	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (m)			229			
pX, platoon unblocked						
vC, conflicting volume	692	294	306			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	692	294	306			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	80	97			
cM capacity (veh/h)	398	745	1255			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	202	361	306			
Volume Left	52	37	0			
Volume Right	150	0	24			
cSH	608	1255	1700			
Volume to Capacity	0.33	0.03	0.18			
Queue Length 95th (m)	11.6	0.7	0.0			
Control Delay (s)	13.8	1.1	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.8	1.1	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.7				
Intersection Capacity Utilization		72.0%		ICU Level of Service	C	
Analysis Period (min)		15				

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
Page 15

Junctions 8
ARCADY 8 - Roundabout Module
Version: 8.0.6.541 [19821,26/11/2015] © Copyright TRL Limited, 2023
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:04:54 PM

Summary of intersection performance

	AM						Intersection Delay (s)	Intersection LOS
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS			
A1 - TT 2035								
Intersection 1 - Leg North	1.96	2.23	12.14	0.64	B	12.15	B	
Intersection 1 - Leg West	3.50	9.79	15.65	0.77	C			
Intersection 1 - Leg East	1.30	1.04	7.54	0.56	A			
Intersection 2 - Leg North	0.54	1.11	3.27	0.32	A	3.08	A	
Intersection 2 - Leg West	0.76	1.09	3.31	0.41	A			
Intersection 2 - Leg East	0.45	~1	2.60	0.30	A			
Intersection 3 - Leg North	0.22	~1	3.22	0.17	A	3.88	A	
Intersection 3 - Leg West	1.11	?	4.84	0.51	A			
Intersection 3 - Leg East	0.46	1.05	3.22	0.31	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 - Existing, AM' model duration: 8:00 AM - 9:30 AM
'D2 - Existing, PM' model duration: 4:00 PM - 5:30 PM
'D3 - BG 2030, AM' model duration: 8:00 AM - 9:30 AM
'D4 - BG 2030, PM' model duration: 4:00 PM - 5:30 PM
'D5 - BG 2035, AM' model duration: 8:00 AM - 9:30 AM
'D6 - BG 2035, PM' model duration: 4:00 PM - 5:30 PM
'D7 - BG 2040, AM' model duration: 8:00 AM - 9:30 AM
'D8 - BG 2040, PM' model duration: 4:00 PM - 5:30 PM
'D9 - TT 2030, AM' model duration: 8:00 AM - 9:30 AM
'D10 - TT 2030, PM' model duration: 4:00 PM - 5:30 PM
'D11 - TT 2035, AM' model duration: 8:00 AM - 9:30 AM
'D12 - TT 2035, PM' model duration: 4:00 PM - 5:30 PM
'D13 - TT 2040, AM' model duration: 8:00 AM - 9:30 AM
'D14 - TT 2040, PM' model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:04:53 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

file:///C:/Users/AdamMorrison/OneDrive%20-%20Paradigm/Desktop/Projects/210565%... 2023-11-22

(Default Analysis Set) - TT 2035, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
TT 2035, AM	TT 2035	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				12.15	B
2	2	Dual Lane	Roundabout	North,West,East				3.08	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				3.88	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width	E - Entry width	F - Effective flare length	R - Entry radius	D - Inscribed circle diameter	PHI - Conflict (entry) angle	Exit

		(m)	(m)	(m)	(m)	(m)	(deg)	Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	536.00	100.000
1	West	ONE HOUR	✓	753.00	100.000

1	East	ONE HOUR	✓	570.00	100.000
2	North	ONE HOUR	✓	536.00	100.000
2	West	ONE HOUR	✓	753.00	100.000
2	East	ONE HOUR	✓	570.00	100.000
3	North	ONE HOUR	✓	536.00	100.000
3	West	ONE HOUR	✓	753.00	100.000
3	East	ONE HOUR	✓	570.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
North	0.000	310.000	226.000	
West	153.000	0.000	600.000	
East	97.000	473.000	0.000	

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

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.20	0.00	0.80	
East	0.17	0.83	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.000	310.000	226.000	
West	153.000	0.000	600.000	
East	97.000	473.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.20	0.00	0.80	
East	0.17	0.83	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.000	310.000	226.000	
West	153.000	0.000	600.000	
East	97.000	473.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.20	0.00	0.80	
East	0.17	0.83	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 1 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	1.000	1.150	1.070	
West	1.270	1.000	1.050	
East	1.000	1.050	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.0	15.0	7.0	
West	27.0	0.0	5.0	
East	0.0	5.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.64	12.14	1.96	2.23	B	491.84	737.76	110.95	9.02	1.23	110.96	9.02
1	West	0.77	15.65	3.50	9.79	C	690.97	1036.45	183.30	10.61	2.04	183.34	10.61
1	East	0.56	7.54	1.30	1.04	A	523.04	784.56	81.98	6.27	0.91	81.99	6.27
2	North	0.32	3.27	0.54	1.11	A	491.84	737.76	36.18	2.94	0.40	36.18	2.94
2	West	0.41	3.31	0.76	1.09	A	690.97	1036.45	50.99	2.95	0.57	51.00	2.95
2	East	0.30	2.60	0.45	~1	A	523.04	784.56	31.54	2.41	0.35	31.54	2.41
3	North	0.17	3.22	0.22	~1	A	491.84	311.07	15.51	2.99	0.17	15.51	2.99
3	West	0.51	4.84	1.11	?	A	690.97	1036.45	71.39	4.13	0.79	71.40	4.13
3	East	0.31	3.22	0.46	1.05	A	523.04	651.05	32.31	2.98	0.36	32.31	2.98

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	403.53		100.88			400.63	186.91	354.08	0.00	1016.78	694.38	0.397	0.00	0.72	6.485	A
1	West	566.90		141.72			562.54	585.78	168.92	0.00	1123.94	1052.25	0.504	0.00	1.09	6.928	A
1	East	429.13		107.28			426.69	617.16	114.30	0.00	1155.55	1097.96	0.371	0.00	0.61	5.126	A
2	North	403.53		100.88			402.36	187.70	355.22	0.00	1935.90	1042.49	0.208	0.00	0.29	2.616	A
2	West	566.90		141.72			565.26	587.93	169.65	0.00	2070.06	1874.93	0.274	0.00	0.41	2.601	A
2	East	429.13		107.28			428.07	620.06	114.85	0.00	2109.68	1917.29	0.203	0.00	0.27	2.228	A
3	North	403.53	170.14	42.54	233.38	73.03	169.62	114.74	355.02	0.00	1562.39	663.42	0.109	0.00	0.13	2.766	A
3	West	566.90	566.90	141.72	0.00	233.38	564.72	355.02	169.62	0.00	1694.07	1343.34	0.335	0.00	0.54	3.464	A

3	East	429.13	356.10	89.02	73.03	0.00	355.02	619.60	114.74	0.00	1733.05	1620.68	0.205	0.00	0.27	2.739	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	481.85		120.46			480.48	224.11	424.46	0.00	976.04	694.38	0.494	0.72	1.07	8.076	A
1	West	676.93		169.23			674.57	702.35	202.59	0.00	1104.45	1052.25	0.613	1.09	1.68	9.063	A
1	East	512.42		128.10			511.51	740.09	137.06	0.00	1142.37	1007.96	0.449	0.61	0.84	5.532	A
2	North	481.85		120.46			481.50	224.59	424.98	0.00	1885.47	1042.49	0.256	0.29	0.38	2.858	A
2	West	676.93		169.23			676.42	703.46	203.02	0.00	2045.94	1874.93	0.331	0.41	0.54	2.961	A
2	East	512.42		128.10			512.13	742.00	137.44	0.00	2093.35	1917.29	0.245	0.27	0.34	2.370	A
3	North	481.85	203.17	50.79	278.68	87.20	203.03	137.39	424.92	0.00	1512.74	663.42	0.134	0.13	0.17	2.940	A
3	West	676.93	676.93	169.23	0.00	278.68	676.16	424.92	203.03	0.00	1670.34	1343.34	0.405	0.54	0.74	3.935	A
3	East	512.42	425.22	106.30	87.20	0.00	424.92	741.80	137.39	0.00	1716.97	1620.68	0.248	0.27	0.34	2.925	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	590.15		147.54			586.74	273.56	519.28	0.00	921.16	694.38	0.641	1.07	1.92	11.880	B
1	West	829.07		207.27			822.26	858.63	247.40	0.00	1078.52	1052.25	0.769	1.68	3.38	14.597	B
1	East	627.58		156.90			625.77	902.58	167.07	0.00	1125.01	1097.96	0.558	0.84	1.29	7.481	A
2	North	590.15		147.54			589.54	275.00	520.40	0.00	1816.49	1042.49	0.325	0.38	0.53	3.269	A
2	West	829.07		207.27			828.18	861.37	248.57	0.00	2013.00	1874.93	0.412	0.54	0.76	3.305	A
2	East	627.58		156.90			627.12	908.48	168.28	0.00	2071.06	1917.29	0.303	0.34	0.45	2.596	A
3	North	590.15	248.83	62.21	341.32	106.80	248.61	168.16	520.31	0.00	1444.99	663.42	0.172	0.17	0.22	3.219	A
3	West	829.07	829.07	207.27	0.00	341.32	827.60	520.31	248.61	0.00	1637.97	1343.34	0.506	0.74	1.10	4.826	A
3	East	627.58	520.78	130.20	106.80	0.00	520.31	908.05	168.16	0.00	1695.11	1620.68	0.307	0.34	0.46	3.215	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	590.15		147.54			590.00	275.15	520.74	0.00	920.32	694.38	0.641	1.92	1.96	12.136	B
1	West	829.07		207.27			828.61	861.97	248.77	0.00	1077.72	1052.25	0.769	3.38	3.50	15.649	C
1	East	627.58		156.90			627.53	909.01	168.36	0.00	1124.26	1097.96	0.558	1.29	1.30	7.542	A
2	North	590.15		147.54			590.14	275.25	520.78	0.00	1816.21	1042.49	0.325	0.53	0.54	3.272	A
2	West	829.07		207.27			829.06	862.09	248.83	0.00	2012.82	1874.93	0.412	0.76	0.76	3.308	A
2	East	627.58		156.90			627.58	909.43	168.45	0.00	2070.93	1917.29	0.303	0.45	0.45	2.596	A
3	North	590.15	248.83	62.21	341.32	106.80	248.83	168.45	520.78	0.00	1444.65	663.42	0.172	0.22	0.22	3.220	A
3	West	829.07	829.07	207.27	0.00	341.32	829.04	520.78	248.83	0.00	1637.81	1343.34	0.506	1.10	1.11	4.843	A
3	East	627.58	520.78	130.20	106.80	0.00	520.78	909.42	168.45	0.00	1694.90	1620.68	0.307	0.46	0.46	3.218	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	481.85		120.46			485.24	226.45	426.69	0.00	974.75	694.38	0.494	1.96	1.11	8.255	A
1	West	676.93		169.23			683.84	707.34	204.60	0.00	1103.29	1052.25	0.614	3.50	1.77	9.487	A
1	East	512.42		128.10			514.20	749.49	138.95	0.00	1141.28	1097.96	0.449	1.30	0.86	5.993	A
2	North	481.85		120.46			482.46	225.00	425.59	0.00	1885.03	1042.49	0.256	0.54	0.38	2.862	A
2	West	676.93		169.23			677.81	704.62	203.42	0.00	2045.65	1874.93	0.331	0.76	0.54	2.867	A
2	East	512.42		128.10			512.87	743.51	137.72	0.00	2093.14	1917.29	0.245	0.45	0.34	2.373	A
3	North	481.85	203.17	50.79	278.68	87.20	203.39	137.84	425.69	0.00	1512.19	663.42	0.134	0.22	0.17	2.943	A
3	West	676.93	676.93	169.23	0.00	278.68	678.38	425.69	203.39	0.00	1670.09	1343.34	0.405	1.11	0.75	3.956	A
3	East	512.42	425.22	106.30	87.20	0.00	425.69	743.93	137.84	0.00	1716.65	1620.68	0.248	0.46	0.35	2.928	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	403.53		100.88			404.99	188.90	356.89	0.00	1015.15	694.38	0.398	1.11	0.74	6.595	A
1	West	566.90		141.72			569.48	591.11	170.76	0.00	1122.87	1052.25	0.505	1.77	1.13	7.111	A
1	East	429.13		107.28			430.07	624.53	115.71	0.00	1154.73	1097.96	0.372	0.86	0.62	5.178	A
2	North	403.53		100.88			403.89	188.37	356.34	0.00	1935.10	1042.49	0.209	0.38	0.29	2.621	A
2	West	566.90		141.72			567.41	589.93	170.30	0.00	2069.60	1874.93	0.274	0.54	0.41	2.608	A
2	East	429.13		107.28			429.41	622.42	115.29	0.00	2109.36	1917.29	0.203	0.34	0.27	2.232	A
3	North	403.53	170.14	42.54	233.38	73.03	170.29	115.35	356.40	0.00	1561.41	663.42	0.109	0.17	0.13	2.768	A
3	West	566.90	566.90	141.72	0.00	233.38	567.68	356.40	170.29	0.00	1693.60	1343.34	0.335	0.75	0.55	3.481	A

3	East	429.13	356.10	89.02	73.03	0.00	356.40	622.62	115.35	0.00	1732.62	1620.68	0.206	0.35	0.27	2.746	A

Queueing Delay Results for each time segment**Queueing Delay results: (08:00-08:15)**

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	10.44	0.70	6.485	A	A
1	West	15.59	1.04	6.923	A	A
1	East	8.85	0.59	5.126	A	A
2	North	4.31	0.29	2.616	A	A
2	West	6.02	0.40	2.601	A	A
2	East	3.92	0.26	2.228	A	A
3	North	1.92	0.13	2.766	A	A
3	West	7.97	0.53	3.464	A	A
3	East	3.99	0.27	2.739	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	15.45	1.03	8.076	A	A
1	West	24.03	1.60	9.063	A	A
1	East	12.22	0.81	5.932	A	A
2	North	5.64	0.38	2.858	A	A
2	West	7.92	0.53	2.861	A	A
2	East	4.99	0.33	2.370	A	A
3	North	2.45	0.16	2.940	A	A
3	West	10.83	0.72	3.935	A	A
3	East	5.10	0.34	2.925	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	26.98	1.80	11.880	B	B
1	West	46.04	3.07	14.897	B	B
1	East	18.60	1.24	7.481	A	A
2	North	7.87	0.52	3.269	A	A
2	West	11.16	0.74	3.305	A	A
2	East	6.67	0.44	2.596	A	A
3	North	3.28	0.22	3.219	A	A
3	West	16.10	1.07	4.826	A	A
3	East	6.84	0.46	3.215	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	29.12	1.94	12.136	B	B
1	West	51.80	3.45	15.649	C	B
1	East	19.47	1.30	7.542	A	A
2	North	8.02	0.53	3.272	A	A
2	West	11.38	0.76	3.308	A	A
2	East	6.77	0.45	2.596	A	A
3	North	3.33	0.22	3.220	A	A
3	West	16.61	1.11	4.843	A	A
3	East	6.96	0.46	3.218	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	17.42	1.16	8.255	A	A
1	West	28.25	1.88	9.487	A	A
1	East	13.30	0.89	5.993	A	A
2	North	5.85	0.39	2.862	A	A
2	West	8.24	0.55	2.867	A	A
2	East	5.14	0.34	2.373	A	A
3	North	2.53	0.17	2.943	A	A
3	West	11.47	0.76	3.956	A	A
3	East	5.28	0.35	2.928	A	A

Queueing Delay results: (09:15

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	11.53	0.77	6.595	A	A
1	West	17.59	1.17	7.111	A	A
1	East	9.55	0.64	5.178	A	A
2	North	4.48	0.30	2.621	A	A
2	West	6.27	0.42	2.608	A	A
2	East	4.04	0.27	2.232	A	A
3	North	1.99	0.13	2.768	A	A
3	West	8.41	0.56	3.481	A	A
3	East	4.14	0.28	2.746	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.72	-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
1	West	1.09	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.61	-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
2	North	0.29	-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
2	West	0.41	-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
2	East	0.27	-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
3	North	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
3	West	0.54	-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
3	East	0.27	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.07	0.00	0.00	1.11	1.11			N/A	N/A
1	West	1.68	0.00	0.00	3.26	4.35			N/A	N/A
1	East	0.84	0.00	0.00	0.00	1.04			N/A	N/A
2	North	0.38	-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
2	West	0.54	-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
2	East	0.34	-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
3	North	0.17	-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
3	West	0.74	-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
3	East	0.34	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.92	0.00	0.00	0.00	2.23			N/A	N/A
1	West	3.38	0.00	0.00	2.18	9.79			N/A	N/A
1	East	1.29	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.53	-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
2	West	0.76	-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
2	East	0.45	-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
3	North	0.22	-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
3	West	1.10	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.46	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.96	0.00	0.00	0.00	2.23			N/A	N/A

1	West	3.50	0.00	0.00	0.00	5.44			N/A	N/A
1	East	1.30	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.54	0.00	0.00	0.00	1.11			N/A	N/A
2	West	0.76	0.00	0.00	0.00	1.09			N/A	N/A
2	East	0.45	-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
3	North	0.22	-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
3	West	1.11	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.46	0.00	0.00	0.00	1.05			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.11	0.00	0.00	1.11	2.23			N/A	N/A
1	West	1.77	0.00	0.00	3.26	5.44			N/A	N/A
1	East	0.86	0.00	0.00	0.00	1.04			N/A	N/A
2	North	0.38	-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
2	West	0.54	-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
2	East	0.34	-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
3	North	0.17	-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
3	West	0.75	-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
3	East	0.35	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.74	0.00	0.00	1.11	1.11			N/A	N/A
1	West	1.13	0.00	0.00	1.09	3.26			N/A	N/A
1	East	0.62	-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
2	North	0.29	-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
2	West	0.41	-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
2	East	0.27	-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
3	North	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
3	West	0.55	-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
3	East	0.27	-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

Queuing and Blocking Report

Total - 2035
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	66.6	148.2	70.0	55.6	125.2	58.3	68.5	69.8	161.0
Average Queue (m)	16.1	74.5	34.5	13.2	58.1	23.4	28.1	50.6	62.7
95th Queue (m)	43.2	125.2	78.9	35.4	102.3	47.8	52.9	81.3	135.5
Link Distance (m)	902.3			568.8			768.8		
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		
Storage Blk Time (%)			37	2	11		21	16	53
Queuing Penalty (veh)			77	15	5		45	17	125

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	33.0	32.0	92.0	46.3
Average Queue (m)	15.8	15.4	43.0	21.8
95th Queue (m)	25.6	26.3	77.1	36.7
Link Distance (m)	410.2	524.9	2077.4	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	159.3	66.1	117.6
Average Queue (m)	48.4	20.4	47.5
95th Queue (m)	133.6	44.6	96.8
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

Total - 2035
AM Peak Hour

Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	24.1	21.1
Average Queue (m)	13.0	3.9
95th Queue (m)	20.8	13.6
Link Distance (m)	280.2	132.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	11.6	3.6
Average Queue (m)	3.2	0.1
95th Queue (m)	10.4	1.8
Link Distance (m)	144.8	133.9
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	30.8	19.7	1.3
Average Queue (m)	14.0	2.8	0.0
95th Queue (m)	23.4	11.5	0.9
Link Distance (m)	198.0	209.5	132.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 327

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↱	↰	↰	↰	↰	↱	↱	↰	↱	↱
Traffic Volume (vph)	84	808	214	58	822	192	174	258	96	148	276	98
Future Volume (vph)	84	808	214	58	822	192	174	258	96	148	276	98
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.972			0.959			0.961	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1348	1597	1054	1401	1317	0	1299	1245	0	1299	1234	0
Flt Permitted	0.087			0.087			0.352			0.376		
Satd. Flow (perm)	123	1597	1054	128	1317	0	481	1245	0	514	1234	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76		19		25			24		
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	936.7			581.5			783.0			217.0		
Travel Time (s)	67.4			41.9			56.4			15.6		
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	91	878	233	63	893	209	189	280	104	161	300	107
Shared Lane Traffic (%)												
Lane Group Flow (vph)	91	878	233	63	1102	0	189	384	0	161	407	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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	
Detector 1 Queue (s)	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	
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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	46.0	46.0	46.0	46.0	46.0		36.0	36.0		36.0	36.0	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51		0.40	0.40		0.40	0.40	
v/c Ratio	1.47	1.08	0.41	0.97	1.62		0.98	0.75		0.79	0.80	
Control Delay	304.9	77.9	11.3	134.5	306.2		92.0	32.5		52.6	36.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	304.9	77.9	11.3	134.5	306.2		92.0	32.5		52.6	36.5	
LOS	F	E	B	F	F		F	C		D	D	
Approach Delay		82.2			296.9			52.1			41.1	
Approach LOS		F			F			D			D	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 115

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.62

Intersection Signal Delay: 141.9

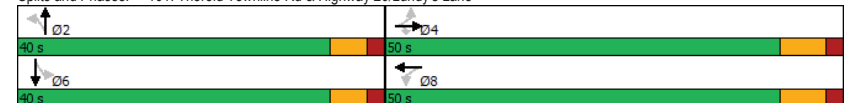
Intersection LOS: F

Intersection Capacity Utilization 138.4%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

PM Peak Hour

	↖	→	↗	↖	←	↖	↑	↗	↓
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	91	878	233	63	1102	189	384	161	407
v/c Ratio	1.47	1.08	0.41	0.97	1.62	0.98	0.75	0.79	0.80
Control Delay	304.9	77.9	11.3	134.5	306.2	92.0	32.5	52.6	36.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	304.9	77.9	11.3	134.5	306.2	92.0	32.5	52.6	36.5
Queue Length 50th (m)	~22.8	~179.7	15.7	10.5	~292.8	33.2	55.0	25.0	60.6
Queue Length 95th (m)	#42.9	#252.0	33.7	#26.2	#371.0	#77.6	#101.4	#61.7	#112.7
Internal Link Dist (m)		912.7			557.5		759.0		193.0
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	62	816	575	65	682	192	513	205	508
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.47	1.08	0.41	0.97	1.62	0.98	0.75	0.79	0.80

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.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2035

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	84	808	214	58	822	192	174	258	96	148	276	98
Future Volume (vph)	84	808	214	58	822	192	174	258	96	148	276	98
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	1597	1054	1401	1317		1299	1245		1299	1234	
Flt Permitted	0.09	1.00	1.00	0.09	1.00		0.35	1.00		0.38	1.00	
Satd. Flow (perm)	123	1597	1054	128	1317		481	1245		515	1234	
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)	91	878	233	63	893	209	189	280	104	161	300	107
RTOR Reduction (vph)	0	0	37	0	9	0	0	15	0	0	14	0
Lane Group Flow (vph)	91	878	196	63	1093	0	189	369	0	161	393	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Effective Green, g (s)	46.0	46.0	46.0	46.0	46.0		36.0	36.0		36.0	36.0	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51		0.40	0.40		0.40	0.40	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	62	816	538	65	673		192	498		206	493	
v/s Ratio Prot		0.55			c0.83			0.30			0.32	
v/s Ratio Perm	0.74		0.19	0.49			c0.39			0.31		
v/c Ratio	1.47	1.08	0.36	0.97	1.62		0.98	0.74		0.78	0.80	
Uniform Delay, d1	22.0	22.0	13.2	21.3	22.0		26.7	23.0		23.6	23.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	279.2	54.0	0.4	99.6	287.4		60.0	5.9		17.3	8.7	
Delay (s)	301.2	76.0	13.6	120.9	309.4		86.7	28.9		40.9	32.5	
Level of Service	F	E	B	F	F		F	C		D	C	
Approach Delay (s)		80.9			299.2			48.0			34.8	
Approach LOS		F			F			D			C	

Intersection Summary

HCM 2000 Control Delay 140.6 HCM 2000 Level of Service F

HCM 2000 Volume to Capacity ratio 1.34

Actuated Cycle Length (s) 90.0 Sum of lost time (s) 8.0

Intersection Capacity Utilization 138.4% ICU Level of Service H

Analysis Period (min) 15

c Critical Lane Group

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2035

PM Peak Hour

	↖	→	↗	↖	←	↖	↖	↑	↗	↖	↓	↖
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	45	249	50	184	210	33	50	278	138	41	381	82
Future Volume (vph)	45	249	50	184	210	33	50	278	138	41	381	82
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.981			0.990			0.960			0.978	
Flt Protected		0.993			0.979			0.995			0.996	
Satd. Flow (prot)	0	1428	0	0	1426	0	0	1340	0	0	1357	0
Flt Permitted		0.993			0.979			0.995			0.996	
Satd. Flow (perm)	0	1428	0	0	1426	0	0	1340	0	0	1357	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2106.3			714.3	
Travel Time (s)		30.1			38.7			151.7			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	49	271	54	200	228	36	54	302	150	45	414	89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	374	0	0	464	0	0	506	0	0	548	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	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 110.6%

ICU Level of Service H

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Total - 2035

PM Peak Hour

	↖	→	↗	↖	←	↖	↖	↑	↗	↖	↓	↖
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	45	249	50	184	210	33	50	278	138	41	381	82
Future Volume (vph)	45	249	50	184	210	33	50	278	138	41	381	82
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)	49	271	54	200	228	36	54	302	150	45	414	89
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	374	464	506	548								
Volume Left (vph)	49	200	54	45								
Volume Right (vph)	54	36	150	89								
Hadj (s)	-0.04	0.05	-0.06	0.03								
Departure Headway (s)	9.5	9.6	9.5	9.6								
Degree Utilization, x	0.99	1.24	1.33	1.46								
Capacity (veh/h)	374	381	388	387								
Control Delay (s)	75.3	156.2	193.5	245.0								
Approach Delay (s)	75.3	156.2	193.5	245.0								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay		175.9										
Level of Service		F										
Intersection Capacity Utilization		110.6%		ICU Level of Service					H			
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2035
PM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	360	914	834	26	193	262
Future Volume (vph)	360	914	834	26	193	262
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.996		0.922	
Flt Protected		0.986			0.979	
Satd. Flow (prot)	0	1192	1342	0	1266	0
Flt Permitted		0.986			0.979	
Satd. Flow (perm)	0	1192	1342	0	1266	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	391	993	907	28	210	285
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1384	935	0	495	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	211.8%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2035
PM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	360	914	834	26	193	262
Future Volume (veh/h)	360	914	834	26	193	262
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	391	993	907	28	210	285
Approach Volume (veh/h)		1384	935		495	
Crossing Volume (veh/h)		210	391		907	
High Capacity (veh/h)		1175	1018		672	
High v/c (veh/h)		1.18	0.92		0.74	
Low Capacity (veh/h)		971	830		525	
Low v/c (veh/h)		1.43	1.13		0.94	
Intersection Summary						
Maximum v/c High	1.18					
Maximum v/c Low	1.43					
Intersection Capacity Utilization	211.8%		ICU Level of Service		H	

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2035
PM Peak Hour

Intersection			
Intersection Delay, s/veh	102.5		
Intersection LOS	F		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1384	935	495
Demand Flow Rate, veh/h	1406	963	524
Vehicles Circulating, veh/h	210	403	934
Vehicles Exiting, veh/h	1247	1213	432
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	140.4	66.3	65.0
Approach LOS	F	F	F
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1406	963	524
Cap Entry Lane, veh/h	1114	915	532
Entry HV Adj Factor	0.984	0.971	0.945
Flow Entry, veh/h	1384	935	495
Cap Entry, veh/h	1096	888	503
V/C Ratio	1.262	1.053	0.984
Control Delay, s/veh	140.4	66.3	65.0
LOS	F	F	F
95th %tile Queue, veh	47	22	13

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2035
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	82	103	189	301	411	69
Future Volume (vph)	82	103	189	301	411	69
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.925				0.981	
Flt Protected	0.978			0.981		
Satd. Flow (prot)	1315	0	0	1181	1335	0
Flt Permitted	0.978			0.981		
Satd. Flow (perm)	1315	0	0	1181	1335	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	304.3			152.9	152.0	
Travel Time (s)	21.9			11.0	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	112	205	327	447	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	201	0	0	532	522	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	100.0%			ICU Level of Service F		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2035
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	82	103	189	301	411	69
Future Volume (Veh/h)	82	103	189	301	411	69
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)	89	112	205	327	447	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				370		
pX, platoon unblocked						
vC, conflicting volume	1222	484	522			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1222	484	522			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	44	81	80			
cM capacity (veh/h)	160	582	1044			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	201	532	522			
Volume Left	89	205	0			
Volume Right	112	0	75			
cSH	268	1044	1700			
Volume to Capacity	0.75	0.20	0.31			
Queue Length 95th (m)	43.6	5.8	0.0			
Control Delay (s)	50.0	5.0	0.0			
Lane LOS	E	A				
Approach Delay (s)	50.0	5.0	0.0			
Approach LOS	E					
Intersection Summary						
Average Delay		10.1				
Intersection Capacity Utilization		100.0%		ICU Level of Service	F	
Analysis Period (min)		15				

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2035
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (vph)	3	5	9	374	475	4
Future Volume (vph)	3	5	9	374	475	4
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916				0.999	
Flt Protected	0.982			0.999		
Satd. Flow (prot)	1308	0	0	1203	1359	0
Flt Permitted	0.982			0.999		
Satd. Flow (perm)	1308	0	0	1203	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	79.3			152.0	2106.3	
Travel Time (s)	5.7			10.9	151.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	5	10	407	516	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	0	417	520	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 51.6%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2035
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	5	9	374	475	4
Future Volume (Veh/h)	3	5	9	374	475	4
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)	3	5	10	407	516	4
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	945	518	520			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	945	518	520			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	288	558	1046			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	8	417	520			
Volume Left	3	10	0			
Volume Right	5	0	4			
cSH	413	1046	1700			
Volume to Capacity	0.02	0.01	0.31			
Queue Length 95th (m)	0.5	0.2	0.0			
Control Delay (s)	13.9	0.3	0.0			
Lane LOS	B	A				
Approach Delay (s)	13.9	0.3	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			51.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2035
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	38	107	83	452	416	98
Future Volume (vph)	38	107	83	452	416	98
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900				0.974	
Flt Protected	0.987			0.992		
Satd. Flow (prot)	1292	0	0	1194	1325	0
Flt Permitted	0.987			0.992		
Satd. Flow (perm)	1292	0	0	1194	1325	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	214.7			217.0	152.9	
Travel Time (s)	15.5			15.6	11.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	116	90	491	452	107
Shared Lane Traffic (%)						
Lane Group Flow (vph)	157	0	0	581	559	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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	103.2%			ICU Level of Service G		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis 203: Thorold Townline Rd & Street C

Total - 2035
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	38	107	83	452	416	98
Future Volume (Veh/h)	38	107	83	452	416	98
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)	41	116	90	491	452	107
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				217		
pX, platoon unblocked						
vC, conflicting volume	1176	506	559			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1176	506	559			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	80	91			
cM capacity (veh/h)	192	567	1012			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	157	581	559			
Volume Left	41	90	0			
Volume Right	116	0	107			
cSH	376	1012	1700			
Volume to Capacity	0.42	0.09	0.33			
Queue Length 95th (m)	16.0	2.3	0.0			
Control Delay (s)	21.3	2.3	0.0			
Lane LOS	C	A				
Approach Delay (s)	21.3	2.3	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		3.6				
Intersection Capacity Utilization		103.2%		ICU Level of Service	G	
Analysis Period (min)		15				

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
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Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821.26/11/2015]

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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:04:32 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
A1 - TT 2035							
Intersection 1 - Leg North	1.97	3.17	14.48	0.66	B		
Intersection 1 - Leg West	179.52	203.11	569.04	1.28	F	378.87	F
Intersection 1 - Leg East	93.48	153.47	308.97	1.16	F		
Intersection 2 - Leg North	0.51	1.06	3.69	0.33	A		
Intersection 2 - Leg West	2.22	3.05	5.74	0.69	A	5.23	A
Intersection 2 - Leg East	1.75	2.06	5.28	0.63	A		
Intersection 3 - Leg North	0.22	~1	3.79	0.18	A		
Intersection 3 - Leg West	5.21	17.26	13.85	0.84	B	9.20	A
Intersection 3 - Leg East	1.52	1.03	6.03	0.60	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:04:31 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

file:///C:/Users/AdamMorrison/OneDrive%20-%20Paradigm/Desktop/Projects/210565%... 2023-11-22

(Default Analysis Set) - TT 2035, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
TT 2035, PM	TT 2035	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				378.87	F
2	2	Dual Lane	Roundabout	North,West,East				5.23	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				9.20	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope (calculated)	Entered intercept (PCE/hr) (calculated)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	455.00	100.000
1	West	ONE HOUR	✓	1274.00	100.000
1	East	ONE HOUR	✓	1094.00	100.000
2	North	ONE HOUR	✓	455.00	100.000

2	West	ONE HOUR	✓	1274.00	100.000
2	East	ONE HOUR	✓	1094.00	100.000
3	North	ONE HOUR	✓	455.00	100.000
3	West	ONE HOUR	✓	1274.00	100.000
3	East	ONE HOUR	✓	1094.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
North	0.000	262.000	193.000	
West	360.000	0.000	914.000	
East	260.000	834.000	0.000	

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

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.28	0.00	0.72	
East	0.24	0.76	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.000	262.000	193.000	
West	360.000	0.000	914.000	
East	260.000	834.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.28	0.00	0.72	
East	0.24	0.76	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.000	262.000	193.000	
West	360.000	0.000	914.000	
East	260.000	834.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.00	0.58	0.42	
West	0.28	0.00	0.72	
East	0.24	0.76	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
North	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 1 (for whole period)

From	To			
	North	West	East	
North	0.0	10.0	0.0	
West	3.0	0.0	1.0	

	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.0	10.0	0.0	
West	3.0	0.0	1.0	
East	3.0	3.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.0	10.0	0.0	
West	3.0	0.0	1.0	
East	3.0	3.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Log	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.66	14.48	1.97	3.17	B	417.52	626.27	114.22	10.94	1.27	114.25	10.95
1	West	1.28	569.04	179.52	203.11	F	1169.04	1753.57	8194.55	280.38	91.05	8686.71	297.22
1	East	1.16	308.97	93.48	153.47	F	1003.87	1505.81	3910.21	155.80	43.45	3940.64	157.02
2	North	0.33	3.69	0.51	1.06	A	417.52	626.27	33.39	3.20	0.37	33.39	3.20
2	West	0.69	5.74	2.22	3.05	A	1169.04	1753.57	128.41	4.39	1.43	128.42	4.39
2	East	0.63	5.28	1.75	2.06	A	1003.87	1505.81	104.26	4.15	1.16	104.27	4.15
3	North	0.18	3.79	0.22	~1	A	417.52	265.65	14.88	3.36	0.17	14.88	3.36
3	West	0.84	13.85	5.21	17.26	B	1169.04	1753.57	247.41	8.47	2.75	247.44	8.47
3	East	0.60	6.03	1.52	1.03	A	1003.87	1147.94	91.89	4.80	1.02	91.89	4.80

Main Results for each time segment

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	342.55		85.64			339.81	458.25	617.99	0.00	864.04	757.41	0.396	0.00	0.68	7.209	A
1	West	959.13		239.78			939.89	813.66	144.14	0.00	1138.28	1035.76	0.843	0.00	4.91	17.669	C
1	East	823.62		205.91			810.64	818.44	265.59	0.00	1067.99	1052.51	0.771	0.00	3.24	13.791	B
2	North	342.55		85.64			341.52	465.12	625.69	0.00	1740.37	1190.02	0.197	0.00	0.26	2.715	A
2	West	959.13		239.78			955.71	822.34	144.86	0.00	2087.98	1827.78	0.459	0.00	0.86	3.220	A
2	East	823.62		205.91			820.75	830.51	270.06	0.00	1997.47	1819.32	0.412	0.00	0.72	3.143	A
3	North	342.55	145.30	36.33	197.25	195.74	144.83	269.58	625.30	0.00	1370.42	712.27	0.106	0.00	0.12	2.937	A
3	West	959.13	959.13	239.78	0.00	197.25	954.02	625.30	144.83	0.00	1711.68	1308.64	0.560	0.00	1.28	4.795	A
3	East	823.62	627.88	156.97	195.74	0.00	625.30	829.27	269.58	0.00	1623.07	1551.90	0.387	0.00	0.65	3.707	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	409.04		102.26			407.44	533.08	729.43	0.00	799.53	757.41	0.512	0.68	1.08	9.650	A
1	West	1145.30		286.32			1081.77	964.05	172.83	0.00	1121.68	1035.76	1.021	4.81	20.69	54.955	F
1	East	983.48		245.87			956.84	948.91	305.68	0.00	1044.79	1052.31	0.941	3.24	9.91	34.551	D
2	North	409.04		102.26			408.68	556.63	748.80	0.00	1651.37	1190.02	0.248	0.26	0.35	3.057	A
2	West	1145.30		286.32			1143.73	984.13	173.35	0.00	2067.38	1827.78	0.554	0.86	1.25	3.952	A
2	East	983.48		245.87			982.24	993.90	323.19	0.00	1959.06	1819.32	0.502	0.72	1.03	3.790	A
3	North	409.04	173.50	43.38	235.53	233.73	173.35	322.72	748.67	0.00	1282.79	712.27	0.135	0.12	0.16	3.244	A
3	West	1145.30	1145.30	286.32	0.00	235.53	1142.08	748.67	173.35	0.00	1691.42	1306.64	0.677	1.28	2.08	6.615	A
3	East	983.48	749.75	187.44	233.73	0.00	748.67	992.71	322.72	0.00	1585.33	1551.90	0.473	0.65	0.92	4.426	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	500.96		125.24			497.63	555.88	788.30	0.00	765.46	757.41	0.654	1.08	1.92	14.008	B
1	West	1402.70		350.68			1097.49	1074.85	211.08	0.00	1099.53	1035.76	1.276	20.69	97.00	202.577	F
1	East	1204.52		301.13			1034.05	998.45	310.12	0.00	1042.21	1052.31	1.156	9.91	52.52	121.078	F
2	North	500.96		125.24			500.31	680.89	916.09	0.00	1530.42	1190.02	0.327	0.35	0.51	3.686	A
2	West	1402.70		350.68			1398.92	1204.18	212.22	0.00	2039.29	1827.78	0.688	1.25	2.19	5.675	A
2	East	1204.52		301.13			1201.68	1215.84	395.30	0.00	1906.63	1819.32	0.632	1.03	1.74	5.237	A
3	North	500.96	212.50	53.12	288.47	286.27	212.23	393.06	915.88	0.00	1164.02	712.27	0.183	0.16	0.22	3.782	A
3	West	1402.70	1402.70	350.68	0.00	288.47	1391.01	915.88	212.23	0.00	1663.81	1306.64	0.843	2.08	5.01	12.877	B
3	East	1204.52	918.25	229.56	286.27	0.00	915.88	1210.17	393.06	0.00	1535.37	1551.90	0.598	0.92	1.51	5.963	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	500.96		125.24			500.74	557.73	793.36	0.00	762.53	757.41	0.657	1.92	1.97	14.479	B
1	West	1402.70		350.68			1098.48	1081.70	212.40	0.00	1098.77	1035.76	1.277	97.00	173.05	446.161	F
1	East	1204.52		301.13			1040.69	1000.48	310.40	0.00	1042.05	1052.31	1.156	52.52	93.48	261.470	F
2	North	500.96		125.24			500.96	682.59	918.21	0.00	1528.89	1190.02	0.328	0.51	0.51	3.694	A
2	West	1402.70		350.68			1402.61	1206.67	212.49	0.00	2039.09	1827.78	0.688	2.19	2.22	5.742	A
2	East	1204.52		301.13			1204.46	1218.76	396.34	0.00	1906.17	1819.32	0.632	1.74	1.75	5.284	A
3	North	500.96	212.50	53.12	288.47	286.27	212.49	396.13	918.19	0.00	1162.38	712.27	0.183	0.22	0.22	3.788	A
3	West	1402.70	1402.70	350.68	0.00	288.47	1401.87	918.19	212.49	0.00	1663.62	1306.64	0.843	5.01	5.21	13.852	B
3	East	1204.52	918.25	229.56	286.27	0.00	918.19	1218.23	396.13	0.00	1533.18	1551.90	0.599	1.51	1.52	6.029	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	409.04		102.26			412.00	560.47	783.16	0.00	768.44	757.41	0.532	1.97	1.23	10.744	B
1	West	1145.30		286.32			1119.43	1020.40	174.76	0.00	1120.56	1035.76	1.022	173.05	179.52	569.036	F
1	East	983.48		245.87			1027.31	977.87	316.32	0.00	1038.63	1052.31	0.947	93.48	82.52	308.973	F
2	North	409.04		102.26			409.69	559.10	751.90	0.00	1649.12	1190.02	0.248	0.51	0.35	3.068	A
2	West	1145.30		286.32			1149.07	987.81	173.78	0.00	2067.08	1827.78	0.554	2.22	1.27	4.000	A
2	East	983.48		245.87			986.31	998.15	324.70	0.00	1957.97	1819.32	0.502	1.75	1.05	3.829	A
3	North	409.04	173.50	43.38	235.53	233.73	173.77	327.06	752.10	0.00	1280.35	712.27	0.136	0.22	0.16	3.255	A
3	West	1145.30	1145.30	286.32	0.00	235.53	1157.44	752.10	173.77	0.00	1691.13	1306.64	0.677	5.21	2.18	6.999	A
3	East	983.48	749.75	187.44	233.73	0.00	752.10	1004.14	327.06	0.00	1582.25	1551.90	0.474	1.52	0.94	4.480	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	342.55		85.64			344.03	562.91	780.62	0.00	769.91	757.41	0.445	1.23	0.86	8.950	A
1	West	959.13		239.78			1130.85	978.72	145.93	0.00	1137.24	1035.76	0.843	179.52	136.59	503.885	F
1	East	823.62		205.91			1023.98	957.23	319.55	0.00	1036.76	1052.31	0.794	82.52	32.43	205.446	F
2	North	342.55		85.64			342.91	467.53	628.86	0.00	1738.08	1190.02	0.197	0.35	0.26	2.725	A
2	West	959.13		239.78			960.75	826.31	145.45	0.00	2087.56	1827.78	0.459	1.27	0.87	3.248	A
2	East	823.62		205.91			824.90	834.72	271.48	0.00	1995.44	1819.32	0.413	1.05	0.73	3.167	A
3	North	342.55	145.30	36.33	197.25	195.74	145.45	272.01	629.00	0.00	1367.76	712.27	0.106	0.16	0.12	2.944	A
3	West	959.13	959.13	239.78	0.00	197.25	962.81	629.00	145.45	0.00	1711.24	1306.64	0.580	2.18	1.31	4.905	A
3	East	823.62	627.88	156.97	195.74	0.00	629.00	836.05	272.01	0.00	1621.35	1551.90	0.387	0.94	0.66	3.739	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	9.82		7.209	A	A
1	West	61.04		4.07	C	B
1	East	43.08		2.87	B	B
2	North	3.90		0.25	A	A
2	West	12.53		0.84	A	A
2	East	10.52		0.70	A	A
3	North	1.74		0.12	A	A
3	West	18.43		4.795	A	A
3	East	9.43		3.707	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	15.53		1.04	A	A
1	West	208.54		13.90	F	D
1	East	115.01		7.67	D	C
2	North	5.12		0.34	A	A
2	West	18.27		1.22	A	A
2	East	15.10		1.01	A	A
3	North	2.31		0.15	A	A
3	West	29.84		1.99	A	A
3	East	13.41		0.89	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	26.75		1.78	B	B
1	West	884.37		58.96	F	F
1	East	474.50		31.63	F	F
2	North	7.52		0.50	A	A
2	West	31.47		2.10	A	A
2	East	25.12		1.67	A	A
3	North	3.28		0.22	A	A
3	West	66.76		4.45	B	B
3	East	21.77		1.45	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	29.25		1.95	B	B
1	West	2025.47		135.03	F	F
1	East	1095.44		73.03	F	F
2	North	7.68		0.51	A	A
2	West	33.11		2.21	A	A
2	East	26.22		1.75	A	A
3	North	3.34		0.22	A	A
3	West	76.96		5.13	B	B
3	East	22.77		1.52	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	19.45		1.30	B	B
1	West	2644.30		178.29	F	F
1	East	1320.01		88.00	F	F
2	North	5.33		0.36	A	A
2	West	19.71		1.31	A	A
2	East	16.16		1.08	A	A
3	North	2.40		0.16	A	A
3	West	35.06		2.34	A	A
3	East	14.46		0.96	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	13.42		0.89	A	A
1	West	2370.82		158.05	F	F
1	East	862.17		57.48	F	F
2	North	3.95		0.26	A	A
2	West	13.31		0.89	A	A

2	East	11.13		0.74		3.167		A		A
3	North	1.81		0.12		2.944		A		A
3	West	20.36		1.36		4.905		A		A
3	East	10.04		0.67		3.739		A		A

Queue Variation Results for each time segment

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.68	~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
1	West	4.81	0.00	0.00	8.12	17.26			N/A	N/A
1	East	3.24	0.00	1.03	7.21	10.30			N/A	N/A
2	North	0.26	~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
2	West	0.86	~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
2	East	0.72	~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
3	North	0.12	~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
3	West	1.28	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.65	~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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.08	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	West	20.69	0.00	12.19	49.76	66.01			N/A	N/A
1	East	9.91	0.00	5.15	23.69	31.93			N/A	N/A
2	North	0.35	~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
2	West	1.25	0.00	0.00	2.03	3.05			N/A	N/A
2	East	1.03	0.00	0.00	1.03	2.06			N/A	N/A
3	North	0.16	~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
3	West	2.08	0.00	0.00	4.06	7.11			N/A	N/A
3	East	0.92	0.00	0.00	1.03	1.03			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.92	0.00	0.00	0.00	3.17			N/A	N/A
1	West	97.00	49.76	92.42	139.13	155.38			N/A	N/A
1	East	52.52	20.60	48.41	82.40	93.73			N/A	N/A
2	North	0.51	~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
2	West	2.19	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.74	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.22	~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
3	West	5.01	0.00	0.00	6.09	17.26			N/A	N/A
3	East	1.51	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.97	0.00	0.00	0.00	2.11			N/A	N/A
1	West	173.05	109.68	168.58	>199	>199			N/A	N/A
1	East	93.48	45.32	88.58	136.99	153.47			N/A	N/A
2	North	0.51	0.00	0.00	0.00	1.06			N/A	N/A
2	West	2.22	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	1.75	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.22	~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
3	West	5.21	0.00	0.00	0.00	10.16			N/A	N/A
3	East	1.52	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.23	0.00	0.00	2.11	2.11			N/A	N/A
1	West	179.52	107.65	174.68	>199	>199			N/A	N/A
1	East	82.52	32.96	76.22	128.75	147.29	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.35	~1	~1	~1	~1			N/A	N/A
2	West	1.27	0.00	0.00	1.02	2.03			N/A	N/A
2	East	1.05	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.16	~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
3	West	2.18	0.00	0.00	4.06	7.11			N/A	N/A
3	East	0.94	0.00	0.00	0.00	1.03			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.86	0.00	0.00	1.06	2.11			N/A	N/A
1	West	136.59	63.98	128.98	>199	>199			N/A	N/A
1	East	32.43	8.24	27.81	56.65	66.95			N/A	N/A
2	North	0.26	~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
2	West	0.87	0.00	0.00	1.02	1.02			N/A	N/A
2	East	0.73	0.00	0.00	0.00	1.03			N/A	N/A
3	North	0.12	~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
3	West	1.31	0.00	0.00	2.03	4.06			N/A	N/A
3	East	0.66	~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

Queuing and Blocking Report

Total - 2035
PM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	72.5	173.6	70.0	134.9	585.2	70.0	555.2	69.9	197.7
Average Queue (m)	34.5	84.5	36.3	64.8	572.9	58.3	239.9	53.2	110.6
95th Queue (m)	76.8	142.5	81.5	170.1	607.5	87.7	623.8	86.7	220.2
Link Distance (m)	902.3				568.8		768.8		197.7
Upstream Blk Time (%)					95		6		8
Queuing Penalty (veh)					0		0		43
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		20.0
Storage Blk Time (%)	4		40		4		60		78
Queuing Penalty (veh)	37		120		34		35		274

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	62.1	174.4	119.6	563.1
Average Queue (m)	30.8	65.5	58.6	336.9
95th Queue (m)	53.5	143.9	108.6	687.9
Link Distance (m)	410.2	524.9	2084.4	705.9
Upstream Blk Time (%)	7			
Queuing Penalty (veh)	0			
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	1008.2	69.1	75.2
Average Queue (m)	864.2	27.3	31.8
95th Queue (m)	1280.1	54.1	63.3
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)	43		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

Total - 2035
PM Peak Hour

Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	58.2	49.4	63.8
Average Queue (m)	22.6	16.5	7.5
95th Queue (m)	47.9	36.1	51.3
Link Distance (m)	295.6	135.8	134.9
Upstream Blk Time (%)	1		
Queuing Penalty (veh)	3		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	9.0	14.4	25.2
Average Queue (m)	2.4	0.8	1.7
95th Queue (m)	8.9	6.0	23.6
Link Distance (m)	70.5	134.9	2084.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	86.1	48.8	94.6
Average Queue (m)	27.7	10.2	18.1
95th Queue (m)	79.1	30.6	85.5
Link Distance (m)	204.4	197.7	135.8
Upstream Blk Time (%)	3		
Queuing Penalty (veh)	15		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 924

Appendix G3

2040 Total Operations Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	72	655	157	50	455	97	117	184	52	165	205	40
Future Volume (vph)	72	655	157	50	455	97	117	184	52	165	205	40
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
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			0.98									
Frt			0.850			0.974			0.967			0.976
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	1566	973	1287	1288	0	1171	1178	0	836	1152	0
Flt Permitted	0.257			0.170			0.513			0.524		
Satd. Flow (perm)	375	1566	952	230	1288	0	632	1178	0	461	1152	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			69		17			19			13	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			229.0	
Travel Time (s)		67.4			41.9			56.4			16.5	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	78	712	171	54	495	105	127	200	57	179	223	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	712	171	54	600	0	127	257	0	179	266	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
Page 1

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	43.7	43.7	43.7	43.7	43.7		36.1	36.1		36.1	36.1	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.50		0.41	0.41		0.41	0.41	
v/c Ratio	0.42	0.91	0.34	0.47	0.92		0.49	0.52		0.95	0.55	
Control Delay	22.3	38.7	9.7	31.0	42.6		28.1	23.2		83.2	24.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.3	38.7	9.7	31.0	42.6		28.1	23.2		83.2	24.9	
LOS	C	D	A	C	D		C	C		F	C	
Approach Delay		32.2			41.6			24.8			48.3	
Approach LOS		C			D			C			D	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 87.8

Natural Cycle: 85

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 36.5

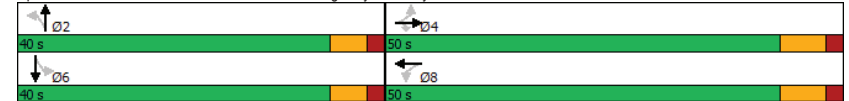
Intersection LOS: D

Intersection Capacity Utilization 100.0%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	78	712	171	54	600	127	257	179	266
v/c Ratio	0.42	0.91	0.34	0.47	0.92	0.49	0.52	0.95	0.55
Control Delay	22.3	38.7	9.7	31.0	42.6	28.1	23.2	83.2	24.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	38.7	9.7	31.0	42.6	28.1	23.2	83.2	24.9
Queue Length 50th (m)	8.3	110.4	9.6	6.0	91.7	17.0	32.1	31.3	34.9
Queue Length 95th (m)	21.9	#187.7	23.3	20.2	#166.3	36.0	57.0	#74.1	61.1
Internal Link Dist (m)		912.7			557.5		759.0		205.0
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	196	822	533	120	684	259	495	189	481
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.87	0.32	0.45	0.88	0.49	0.52	0.95	0.55

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↲	↰	↱	↲	↰	↱	↲	↰	↱	↲
Traffic Volume (vph)	72	655	157	50	455	97	117	184	52	165	205	40
Future Volume (vph)	72	655	157	50	455	97	117	184	52	165	205	40
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.97		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	1566	952	1287	1287		1171	1178		836	1152	
Flt Permitted	0.26	1.00	1.00	0.17	1.00		0.51	1.00		0.52	1.00	
Satd. Flow (perm)	375	1566	952	230	1287		633	1178		460	1152	
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)	78	712	171	54	495	105	127	200	57	179	223	43
RTOR Reduction (vph)	0	0	35	0	9	0	0	11	0	0	8	0
Lane Group Flow (vph)	78	712	136	54	591	0	127	246	0	179	258	0
Confl. Peds. (#/hr)			1		1							
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	40.7	40.7	40.7	40.7	40.7		34.1	34.1		34.1	34.1	
Effective Green, g (s)	43.7	43.7	43.7	43.7	43.7		36.1	36.1		36.1	36.1	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.50		0.41	0.41		0.41	0.41	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	186	779	473	114	640		260	484		189	473	
v/s Ratio Prot		0.45			c0.46			0.21			0.22	
v/s Ratio Perm	0.21		0.14	0.23			0.20			c0.39		
v/c Ratio	0.42	0.91	0.29	0.47	0.92		0.49	0.51		0.95	0.55	
Uniform Delay, d1	14.0	20.3	12.9	14.5	20.5		19.0	19.2		24.9	19.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	15.1	0.3	3.1	19.1		1.4	0.8		49.8	1.3	
Delay (s)	15.5	35.4	13.3	17.6	39.7		20.5	20.1		74.8	20.9	
Level of Service	B	D	B	B	D		C	C		E	C	
Approach Delay (s)		29.9			37.8			20.2			42.6	
Approach LOS		C			D			C			D	

Intersection Summary

HCM 2000 Control Delay	32.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	87.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	100.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2040

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	47	123	37	108	200	4	43	338	142	18	203	41
Traffic Volume (vph)	47	123	37	108	200	4	43	338	142	18	203	41
Future Volume (vph)	47	123	37	108	200	4	43	338	142	18	203	41
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.976			0.998			0.963			0.979		
Flt Protected	0.989			0.983			0.996			0.997		
Satd. Flow (prot)	0	1393	0	0	1435	0	0	1304	0	0	1190	0
Flt Permitted	0.989			0.983			0.996			0.997		
Satd. Flow (perm)	0	1393	0	0	1435	0	0	1304	0	0	1190	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	418.6			537.1			2099.4			714.3		
Travel Time (s)	30.1			38.7			151.2			51.4		
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	51	134	40	117	217	4	47	367	154	20	221	45
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	225	0	0	338	0	0	568	0	0	286	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	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control	Stop			Stop			Stop			Stop		

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 91.1%

ICU Level of Service F

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Total - 2040

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	47	123	37	108	200	4	43	338	142	18	203	41
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	47	123	37	108	200	4	43	338	142	18	203	41
Future Volume (vph)	47	123	37	108	200	4	43	338	142	18	203	41
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)	51	134	40	117	217	4	47	367	154	20	221	45
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	225	338	568	286								
Volume Left (vph)	51	117	47	20								
Volume Right (vph)	40	4	154	45								
Hadj (s)	-0.01	0.09	0.01	0.29								
Departure Headway (s)	8.0	7.6	7.1	7.9								
Degree Utilization, x	0.50	0.72	1.12	0.63								
Capacity (veh/h)	413	446	511	433								
Control Delay (s)	18.7	27.7	101.8	23.2								
Approach Delay (s)	18.7	27.7	101.8	23.2								
Approach LOS	C	D	F	C								
Intersection Summary												
Delay			55.1									
Level of Service			F									
Intersection Capacity Utilization			91.1%									
Analysis Period (min)			15									

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2040
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	157	654	514	99	230	315
Future Volume (vph)	157	654	514	99	230	315
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.978		0.922	
Flt Protected		0.990			0.979	
Satd. Flow (prot)	0	1113	1303	0	1199	0
Flt Permitted		0.990			0.979	
Satd. Flow (perm)	0	1113	1303	0	1199	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	171	711	559	108	250	342
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	882	667	0	592	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	163.1%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2040
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	157	654	514	99	230	315
Future Volume (veh/h)	157	654	514	99	230	315
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	171	711	559	108	250	342
Approach Volume (veh/h)		882	667		592	
Crossing Volume (veh/h)		250	171		559	
High Capacity (veh/h)		1138	1211		890	
High v/c (veh/h)		0.77	0.55		0.66	
Low Capacity (veh/h)		938	1004		716	
Low v/c (veh/h)		0.94	0.66		0.83	
Intersection Summary						
Maximum v/c High	0.77					
Maximum v/c Low	0.94					
Intersection Capacity Utilization	163.1%			ICU Level of Service H		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2040
AM Peak Hour

Intersection			
Intersection Delay, s/veh	27.1		
Intersection LOS	D		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	882	667	592
Demand Flow Rate, veh/h	964	695	661
Vehicles Circulating, veh/h	268	217	587
Vehicles Exiting, veh/h	980	1015	325
Ped Vol Crossing Leg, #/h	0	0	1
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	33.4	12.1	34.8
Approach LOS	D	B	D
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	964	695	661
Cap Entry Lane, veh/h	1050	1106	758
Entry HV Adj Factor	0.915	0.960	0.896
Flow Entry, veh/h	882	667	592
Cap Entry, veh/h	961	1061	679
V/C Ratio	0.918	0.628	0.872
Control Delay, s/veh	33.4	12.1	34.8
LOS	D	B	D
95th %tile Queue, veh	14	5	10

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2040
AM Peak Hour

	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (vph)	71	91	64	302	203	30
Future Volume (vph)	71	91	64	302	203	30
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.924				0.982	
Flt Protected	0.979			0.991		
Satd. Flow (prot)	1315	0	0	1193	1336	0
Flt Permitted	0.979			0.991		
Satd. Flow (perm)	1315	0	0	1193	1336	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	288.9			148.9	150.9	
Travel Time (s)	20.8			10.7	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	99	70	328	221	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	0	398	254	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 69.4%	ICU Level of Service C					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2040
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	71	91	64	302	203	30
Future Volume (Veh/h)	71	91	64	302	203	30
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)	77	99	70	328	221	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				378		
pX, platoon unblocked						
vC, conflicting volume	706	238	254			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	706	238	254			
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	88	95			
cM capacity (veh/h)	381	801	1311			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	176	398	254			
Volume Left	77	70	0			
Volume Right	99	0	33			
cSH	540	1311	1700			
Volume to Capacity	0.33	0.05	0.15			
Queue Length 95th (m)	11.2	1.4	0.0			
Control Delay (s)	14.8	1.8	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.8	1.8	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization		69.4%		ICU Level of Service	C	
Analysis Period (min)		15				

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2040
AM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (vph)	4	8	3	370	225	1
Future Volume (vph)	4	8	3	370	225	1
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.907				0.999	
Flt Protected	0.985					
Satd. Flow (prot)	1299	0	0	1204	1359	0
Flt Permitted	0.985					
Satd. Flow (perm)	1299	0	0	1204	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.4			150.9	2099.4	
Travel Time (s)	11.0			10.9	151.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	9	3	402	245	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	13	0	0	405	246	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 43.8%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2040
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	8	3	370	225	1
Future Volume (Veh/h)	4	8	3	370	225	1
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)	4	9	3	402	245	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	654	246	246			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	654	246	246			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	431	793	1320			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	13	405	246			
Volume Left	4	3	0			
Volume Right	9	0	1			
cSH	630	1320	1700			
Volume to Capacity	0.02	0.00	0.14			
Queue Length 95th (m)	0.5	0.1	0.0			
Control Delay (s)	10.8	0.1	0.0			
Lane LOS	B	A				
Approach Delay (s)	10.8	0.1	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			43.8%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2040
AM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	48	138	34	318	272	22
Future Volume (vph)	48	138	34	318	272	22
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900				0.990	
Flt Protected	0.987			0.995		
Satd. Flow (prot)	1292	0	0	1198	1347	0
Flt Permitted	0.987			0.995		
Satd. Flow (perm)	1292	0	0	1198	1347	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	208.4			229.0	148.9	
Travel Time (s)	15.0			16.5	10.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	150	37	346	296	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	202	0	0	383	320	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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 74.5%	ICU Level of Service D					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis 203: Thorold Townline Rd & Street C

Total - 2040
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	48	138	34	318	272	22
Future Volume (Veh/h)	48	138	34	318	272	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)	52	150	37	346	296	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (m)			229			
pX, platoon unblocked						
vC, conflicting volume	728	308	320			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	728	308	320			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	80	97			
cM capacity (veh/h)	379	732	1240			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	202	383	320			
Volume Left	52	37	0			
Volume Right	150	0	24			
cSH	590	1240	1700			
Volume to Capacity	0.34	0.03	0.19			
Queue Length 95th (m)	12.1	0.7	0.0			
Control Delay (s)	14.2	1.0	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.2	1.0	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay		3.6				
Intersection Capacity Utilization		74.5%		ICU Level of Service	D	
Analysis Period (min)		15				

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
Page 15

Junctions 8
ARCADY 8 - Roundabout Module
Version: 8.0.6.541 [19821,26/11/2015] © Copyright TRL Limited, 2023
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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:04:11 PM

Summary of intersection performance

	AM						Intersection Delay (s)	Intersection LOS
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS			
A1 - TT 2040								
Intersection 1 - Leg North	2.22	4.46	13.61	0.67	B	15.04	C	
Intersection 1 - Leg West	4.99	17.38	21.02	0.83	C			
Intersection 1 - Leg East	1.55	1.04	8.39	0.60	A			
Intersection 2 - Leg North	0.56	1.11	3.39	0.34	A	3.22	A	
Intersection 2 - Leg West	0.87	1.09	3.50	0.44	A			
Intersection 2 - Leg East	0.50	1.04	2.69	0.33	A			
Intersection 3 - Leg North	0.23	~1	3.32	0.18	A	4.14	A	
Intersection 3 - Leg West	1.30	1.09	5.27	0.55	A			
Intersection 3 - Leg East	0.53	1.05	3.36	0.33	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
 "D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
 "D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
 "D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
 "D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
 "D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
 "D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
 "D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
 "D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
 "D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
 "D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
 "D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
 "D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
 "D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:04:10 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	PCE	PCE	perHour	s	-Min	perMin

file:///C:/Users/AdamMorrison/OneDrive%20-%20Paradigm/Desktop/Projects/210565%... 2023-11-22

(Default Analysis Set) - TT 2040, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	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)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
TT 2040, AM	TT 2040	AM		ONE HOUR	08:00	09:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				15.04	C
2	2	Dual Lane	Roundabout	North,West,East				3.22	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				4.14	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width	E - Entry width	F - Effective flare length	R - Entry radius	D - Inscribed circle diameter	PHI - Conflict (entry) angle	Exit

		(m)	(m)	(m)	(m)	(m)	(deg)	Only
1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	545.00	100.000
1	West	ONE HOUR	✓	811.00	100.000

1	East	ONE HOUR	✓	613.00	100.000
2	North	ONE HOUR	✓	545.00	100.000
2	West	ONE HOUR	✓	811.00	100.000
2	East	ONE HOUR	✓	613.00	100.000
3	North	ONE HOUR	✓	545.00	100.000
3	West	ONE HOUR	✓	811.00	100.000
3	East	ONE HOUR	✓	613.00	100.000

Turning Proportions

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

From		To		
		North	West	East
From	North	0.000	315.000	230.000
	West	157.000	0.000	654.000
	East	99.000	514.000	0.000

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

From		To		
		North	West	East
From	North	0.00	0.58	0.42
	West	0.19	0.00	0.81
	East	0.16	0.84	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From		To		
		North	West	East
From	North	0.000	315.000	230.000
	West	157.000	0.000	654.000
	East	99.000	514.000	0.000

Turning Proportions (PCE) - Intersection 2 (for whole period)

From		To		
		North	West	East
From	North	0.00	0.58	0.42
	West	0.19	0.00	0.81
	East	0.16	0.84	0.00

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From		To		
		North	West	East
From	North	0.000	315.000	230.000
	West	157.000	0.000	654.000
	East	99.000	514.000	0.000

Turning Proportions (PCE) - Intersection 3 (for whole period)

From		To		
		North	West	East
From	North	0.00	0.58	0.42
	West	0.19	0.00	0.81
	East	0.16	0.84	0.00

Vehicle Mix

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

From		To		
		North	West	East
From	North	1.000	1.150	1.070
	West	1.270	1.000	1.050
	East	1.000	1.050	1.000

Truck Percentages - Intersection 1 (for whole period)

From		To		
		North	West	East
From	North	0.0	15.0	7.0
	West	27.0	0.0	5.0
	East	0.0	5.0	0.0

From		To		
		North	West	East
From	North	0.0	15.0	7.0
	West	27.0	0.0	5.0
	East	0.0	5.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From		To		
		North	West	East
From	North	1.000	1.150	1.070
	West	1.270	1.000	1.050
	East	1.000	1.050	1.000

Truck Percentages - Intersection 2 (for whole period)

From		To		
		North	West	East
From	North	0.0	15.0	7.0
	West	27.0	0.0	5.0
	East	0.0	5.0	0.0

Average PCE Per Vehicle - Intersection 3 (for whole period)

From		To		
		North	West	East
From	North	1.000	1.150	1.070
	West	1.270	1.000	1.050
	East	1.000	1.050	1.000

Truck Percentages - Intersection 3 (for whole period)

From		To		
		North	West	East
From	North	0.0	15.0	7.0
	West	27.0	0.0	5.0
	East	0.0	5.0	0.0

Results

Results Summary for whole modelled period

Intersection	Leg	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queuing Delay (PCE-min)	Average Queuing Delay (s)	Rate Of Queuing Delay (PCE-min/min)	Inclusive Total Queuing Delay (PCE-min)	Inclusive Average Queuing Delay (s)
1	North	0.67	13.61	2.22	4.46	B	500.10	750.15	122.16	9.77	1.36	122.18	9.77
1	West	0.83	21.02	4.99	17.38	C	744.19	1116.28	239.09	12.85	2.66	239.14	12.85
1	East	0.60	8.39	1.55	1.04	A	562.50	843.75	95.36	6.78	1.06	95.37	6.78
2	North	0.34	3.39	0.56	1.11	A	500.10	750.15	37.83	3.03	0.42	37.83	3.03
2	West	0.44	3.50	0.87	1.09	A	744.19	1116.28	57.39	3.08	0.64	57.39	3.08
2	East	0.33	2.69	0.50	1.04	A	562.50	843.75	34.92	2.48	0.39	34.92	2.48
3	North	0.18	3.32	0.23	~1	A	500.10	316.58	16.18	3.07	0.18	16.18	3.07
3	West	0.55	5.27	1.30	1.09	A	744.19	1116.28	81.96	4.41	0.91	81.96	4.41
3	East	0.33	3.36	0.53	1.05	A	562.50	707.48	36.32	3.08	0.40	36.32	3.08

Main Results for each time segment

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	410.30		102.58			407.24	191.30	384.66	0.00	999.07	686.14	0.411	0.00	0.77	6.746	A
1	West	610.56		152.64			605.47	620.04	171.86	0.00	1122.23	1054.11	0.544	0.00	1.27	7.496	A
1	East	461.50		115.37			458.75	660.12	117.21	0.00	1153.86	1103.60	0.400	0.00	0.69	5.378	A
2	North	410.30		102.58			409.09	192.19	385.99	0.00	1913.66	1023.05	0.214	0.00	0.30	2.664	A
2	West	610.56		152.64			608.75	622.44	172.64	0.00	2067.90	1880.58	0.295	0.00	0.45	2.676	A
2	East	461.50		115.37			460.33	663.55	117.85	0.00	2107.51	1929.51	0.219	0.00	0.29	2.275	A
3	North	410.30	173.16	43.29	237.15	74.53	172.62	117.73	385.76	0.00	1540.55	657.33	0.112	0.00	0.14	2.814	A
3	West	610.56	610.56	152.64	0.00	237.15	608.12		172.62	0.00	1691.95	1347.66	0.361	0.00	0.61	3.601	A

3	East	461.50	386.97	96.74	74.53	0.00	385.76	663.02	117.73	0.00	1730.93	1629.25	0.224	0.00	0.30	2.807	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	489.94		122.49			489.40	229.36	461.16	0.00	954.80	686.14	0.513	0.77	1.15	8.575	A
1	West	729.07		182.27			725.94	743.44	206.11	0.00	1102.41	1054.11	0.661	1.27	2.06	10.301	B
1	East	551.07		137.77			549.09	791.52	140.53	0.00	1140.37	1103.60	0.483	0.69	0.96	6.340	A
2	North	489.94		122.49			489.57	229.97	461.81	0.00	1858.85	1023.05	0.264	0.30	0.40	2.931	A
2	West	729.07		182.27			728.49	744.77	206.61	0.00	2043.34	1880.58	0.357	0.45	0.60	2.972	A
2	East	551.07		137.77			550.75	794.07	141.03	0.00	2090.76	1929.51	0.264	0.29	0.37	2.434	A
3	North	489.94	206.77	51.69	283.18	89.00	206.62	140.96	461.74	0.00	1486.59	657.33	0.139	0.14	0.17	3.009	A
3	West	729.07	729.07	182.27	0.00	283.18	728.16	461.74	206.62	0.00	1667.80	1347.66	0.437	0.61	0.84	4.158	A
3	East	551.07	462.08	115.52	89.00	0.00	461.74	793.82	140.96	0.00	1714.43	1629.25	0.270	0.30	0.39	3.017	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	600.06		150.01			595.98	279.43	564.00	0.00	895.28	686.14	0.670	1.15	2.17	13.229	B
1	West	892.93		223.23			882.26	908.47	251.51	0.00	1076.13	1054.11	0.830	2.06	4.72	19.179	C
1	East	674.93		168.73			672.63	962.98	170.80	0.00	1122.85	1103.60	0.601	0.96	1.54	8.285	A
2	North	600.06		150.01			599.40	281.57	565.49	0.00	1783.89	1023.05	0.336	0.40	0.56	3.386	A
2	West	892.93		223.23			891.88	911.93	252.96	0.00	2009.84	1880.58	0.444	0.60	0.86	3.495	A
2	East	674.93		168.73			674.40	972.18	172.66	0.00	2067.89	1929.51	0.326	0.37	0.50	2.691	A
3	North	600.06	253.23	63.31	346.82	109.00	252.99	172.51	565.37	0.00	1412.98	657.33	0.179	0.17	0.23	3.320	A
3	West	892.93	892.93	223.23	0.00	346.82	891.11	565.37	252.99	0.00	1634.86	1347.66	0.546	0.84	1.29	5.246	A
3	East	674.93	565.92	141.48	109.00	0.00	565.37	971.60	172.51	0.00	1692.02	1629.25	0.334	0.39	0.52	3.353	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	600.06		150.01			598.85	281.64	565.96	0.00	884.20	686.14	0.671	2.17	2.22	13.611	B
1	West	892.93		223.23			891.85	912.56	253.15	0.00	1075.19	1054.11	0.830	4.72	4.99	21.024	C
1	East	674.93		168.73			674.85	972.35	172.65	0.00	1121.78	1103.60	0.602	1.54	1.55	8.386	A
2	North	600.06		150.01			600.05	281.86	565.92	0.00	1783.58	1023.05	0.336	0.56	0.56	3.390	A
2	West	892.93		223.23			892.92	912.74	253.23	0.00	2009.64	1880.58	0.444	0.86	0.87	3.501	A
2	East	674.93		168.73			674.92	973.29	172.86	0.00	2067.74	1929.51	0.326	0.50	0.50	2.691	A
3	North	600.06	253.23	63.31	346.82	109.00	253.23	172.85	565.92	0.00	1412.59	657.33	0.179	0.23	0.23	3.321	A
3	West	892.93	892.93	223.23	0.00	346.82	892.89	565.92	253.23	0.00	1634.69	1347.66	0.546	1.29	1.30	5.272	A
3	East	674.93	565.92	141.48	109.00	0.00	565.92	973.27	172.85	0.00	1691.78	1629.25	0.335	0.52	0.53	3.356	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	489.94		122.49			494.03	232.66	463.97	0.00	953.17	686.14	0.514	2.22	1.20	8.816	A
1	West	729.07		182.27			740.23	749.51	208.49	0.00	1101.04	1054.11	0.662	4.99	2.20	11.153	B
1	East	551.07		137.77			553.33	805.42	143.30	0.00	1138.76	1103.60	0.484	1.55	0.99	6.428	A
2	North	489.94		122.49			490.59	230.42	462.51	0.00	1858.34	1023.05	0.264	0.56	0.40	2.937	A
2	West	729.07		182.27			730.11	746.06	207.04	0.00	2043.03	1880.58	0.357	0.87	0.61	2.980	A
2	East	551.07		137.77			551.59	795.81	141.34	0.00	2090.53	1929.51	0.264	0.50	0.37	2.436	A
3	North	489.94	206.77	51.69	283.18	89.00	207.00	141.49	462.62	0.00	1485.96	657.33	0.139	0.23	0.17	3.011	A
3	West	729.07	729.07	182.27	0.00	283.18	730.87	462.62	207.00	0.00	1667.52	1347.66	0.437	1.30	0.85	4.183	A
3	East	551.07	462.08	115.52	89.00	0.00	462.62	796.38	141.49	0.00	1714.06	1629.25	0.270	0.53	0.39	3.023	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	410.30		102.58			411.95	193.60	387.93	0.00	997.18	686.14	0.411	1.20	0.79	6.878	A
1	West	610.56		152.64			614.07	626.03	173.85	0.00	1121.08	1054.11	0.545	2.20	1.32	7.766	A
1	East	461.50		115.37			462.65	669.05	118.88	0.00	1152.90	1103.60	0.400	0.99	0.70	5.443	A
2	North	410.30		102.58			410.69	192.90	387.24	0.00	1912.76	1023.05	0.215	0.40	0.31	2.674	A
2	West	610.56		152.64			611.16	624.61	173.32	0.00	2067.41	1880.58	0.295	0.61	0.46	6.686	A
2	East	461.50		115.37			461.82	666.16	118.31	0.00	2107.18	1929.51	0.219	0.37	0.29	2.280	A
3	North	410.30	173.16	43.29	237.15	74.53	173.31	118.38	387.31	0.00	1539.45	657.33	0.112	0.17	0.14	2.819	A
3	West	610.56	610.56	152.64	0.00	237.15	611.50	387.31	173.31	0.00	1691.46	1347.66	0.361	0.85	0.62	3.626	A

3	East	461.50	386.97	96.74	74.53	0.00	387.31	666.42	118.38	0.00	1730.47	1629.25	0.224	0.39	0.30	2.816	A

Queueing Delay Results for each time segment

Queueing Delay results: (08:00-08:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	11.03	0.74	6.746	A	A
1	West	16.09	1.21	7.496	A	A
1	East	9.95	0.66	5.378	A	A
2	North	4.47	0.30	2.654	A	A
2	West	6.67	0.44	2.676	A	A
2	East	4.30	0.29	2.275	A	A
3	North	1.99	0.13	2.814	A	A
3	West	8.92	0.59	3.601	A	A
3	East	4.44	0.30	2.807	A	A

Queueing Delay results: (08:15-08:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	16.62	1.11	8.575	A	A
1	West	29.10	1.94	10.301	B	B
1	East	13.99	0.93	6.340	A	A
2	North	5.88	0.39	2.931	A	A
2	West	8.86	0.59	2.972	A	A
2	East	5.51	0.37	2.434	A	A
3	North	2.55	0.17	3.009	A	A
3	West	12.29	0.82	4.158	A	A
3	East	5.71	0.38	3.017	A	A

Queueing Delay results: (08:30-08:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	30.26	2.02	13.229	B	B
1	West	61.93	4.13	19.179	C	B
1	East	21.99	1.47	8.285	A	A
2	North	8.29	0.55	3.386	A	A
2	West	12.68	0.85	3.495	A	A
2	East	7.43	0.50	2.691	A	A
3	North	3.44	0.23	3.320	A	A
3	West	18.77	1.25	5.246	A	A
3	East	7.74	0.52	3.353	A	A

Queueing Delay results: (08:45-09:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	33.04	2.20	13.611	B	B
1	West	73.23	4.88	21.024	C	C
1	East	23.21	1.55	8.386	A	A
2	North	8.44	0.56	3.390	A	A
2	West	12.97	0.86	3.501	A	A
2	East	7.55	0.50	2.691	A	A
3	North	3.49	0.23	3.321	A	A
3	West	19.44	1.30	5.272	A	A
3	East	7.89	0.53	3.356	A	A

Queueing Delay results: (09:00-09:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	18.96	1.26	8.816	A	A
1	West	35.96	2.40	11.153	B	B
1	East	15.40	1.03	6.428	A	A
2	North	6.11	0.41	2.937	A	A
2	West	9.25	0.62	2.980	A	A
2	East	5.69	0.38	2.436	A	A
3	North	2.64	0.18	3.011	A	A
3	West	13.09	0.87	4.183	A	A
3	East	5.93	0.40	3.023	A	A

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	12.25	0.82	6.878	A	A
1	West	20.77	1.38	7.766	A	A
1	East	10.82	0.72	5.443	A	A
2	North	4.64	0.31	2.674	A	A
2	West	6.96	0.46	2.686	A	A
2	East	4.44	0.30	2.290	A	A
3	North	2.07	0.14	2.619	A	A
3	West	9.44	0.63	3.626	A	A
3	East	4.61	0.31	2.816	A	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.77	-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
1	West	1.27	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
1	East	0.69	-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
2	North	0.30	-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
2	West	0.45	-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
2	East	0.29	-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
3	North	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
3	West	0.61	-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
3	East	0.30	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.15	0.00	0.00	1.11	2.23			N/A	N/A
1	West	2.06	0.00	0.00	4.35	6.52			N/A	N/A
1	East	0.96	0.00	0.00	1.04	1.04			N/A	N/A
2	North	0.40	-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
2	West	0.60	-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
2	East	0.37	-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
3	North	0.17	-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
3	West	0.84	0.00	0.00	0.00	1.09			N/A	N/A
3	East	0.39	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	2.17	0.00	0.00	0.00	4.46			N/A	N/A
1	West	4.72	0.00	0.00	7.61	17.38			N/A	N/A
1	East	1.54	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.56	-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
2	West	0.86	-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
2	East	0.50	-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
3	North	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
3	West	1.29	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.52	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	2.22	0.00	0.00	0.00	2.23			N/A	N/A
1	West	4.99	0.00	0.00	2.17	14.12			N/A	N/A

1	East	1.55	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	North	0.56	0.00	0.00	0.00	1.11			N/A	N/A
2	West	0.87	0.00	0.00	0.00	1.09			N/A	N/A
2	East	0.50	0.00	0.00	0.00	1.04			N/A	N/A
3	North	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
3	West	1.30	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.53	0.00	0.00	0.00	1.05			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.20	0.00	0.00	1.11	2.23			N/A	N/A
1	West	2.20	0.00	0.00	4.35	7.61			N/A	N/A
1	East	0.99	0.00	0.00	1.04	1.04			N/A	N/A
2	North	0.40	-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
2	West	0.61	-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
2	East	0.37	-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
3	North	0.17	-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
3	West	0.85	-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
3	East	0.39	-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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.79	0.00	0.00	1.11	1.11			N/A	N/A
1	West	1.32	0.00	0.00	2.17	4.35			N/A	N/A
1	East	0.70	0.00	0.00	0.00	1.04			N/A	N/A
2	North	0.31	-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
2	West	0.46	-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
2	East	0.29	-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
3	North	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
3	West	0.62	-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
3	East	0.30	-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

Queuing and Blocking Report

Total - 2040
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	78.4	156.1	70.0	56.9	125.7	65.7	75.0	69.9	188.3
Average Queue (m)	21.8	94.0	38.4	13.5	65.9	25.4	31.8	63.0	112.3
95th Queue (m)	53.7	153.6	84.0	35.4	112.8	51.7	60.3	82.8	201.0
Link Distance (m)	902.3			568.8			768.8		
Upstream Blk Time (%)									0
Queuing Penalty (veh)									1
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		
Storage Blk Time (%)	42		3		15		24		19
Queuing Penalty (veh)	95		24		8		56		22
							180		49

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	37.3	41.8	103.9	53.0
Average Queue (m)	17.3	19.0	52.7	26.1
95th Queue (m)	29.4	33.1	90.7	42.5
Link Distance (m)	410.2	524.9	2077.4	705.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	343.9	59.7	126.3
Average Queue (m)	143.9	23.0	54.7
95th Queue (m)	357.6	46.8	114.6
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

Total - 2040
AM Peak Hour

Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	30.7	21.3
Average Queue (m)	14.2	4.7
95th Queue (m)	24.9	15.2
Link Distance (m)	280.2	132.0
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	9.2	6.8
Average Queue (m)	2.7	0.3
95th Queue (m)	9.3	3.6
Link Distance (m)	144.8	133.9
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	36.2	17.9	3.4
Average Queue (m)	14.8	3.4	0.2
95th Queue (m)	26.8	12.8	2.7
Link Distance (m)	198.0	209.5	132.0
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 436

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Traffic Volume (vph)	89	838	234	64	876	194	191	273	106	151	298	104
Future Volume (vph)	89	838	234	64	876	194	191	273	106	151	298	104
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			50.0			50.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.973			0.958			0.961	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1348	1597	1054	1401	1318	0	1299	1244	0	1299	1235	0
Flt Permitted	0.087			0.087			0.321			0.347		
Satd. Flow (perm)	123	1597	1054	128	1318	0	439	1244	0	474	1235	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			80		18			26			23	
Link Speed (k/h)	50				50			50			50	
Link Distance (m)	936.7				581.5			783.0			217.0	
Travel Time (s)	67.4				41.9			56.4			15.6	
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	97	911	254	70	952	211	208	297	115	164	324	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	97	911	254	70	1163	0	208	412	0	164	437	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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	
Detector 1 Queue (s)	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	
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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%	55.6%	55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Maximum Green (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	46.0	46.0	46.0	46.0	46.0		36.0	36.0		36.0	36.0	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51		0.40	0.40		0.40	0.40	
v/c Ratio	1.56	1.12	0.44	1.08	1.71		1.19	0.80		0.87	0.86	
Control Delay	343.0	92.5	12.0	165.2	345.5		156.9	36.4		67.1	42.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	343.0	92.5	12.0	165.2	345.5		156.9	36.4		67.1	42.5	
LOS	F	F	B	F	F		F	D		E	D	
Approach Delay		95.5			335.3			76.8			49.2	
Approach LOS		F			F			E			D	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 125

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.71

Intersection Signal Delay: 164.5

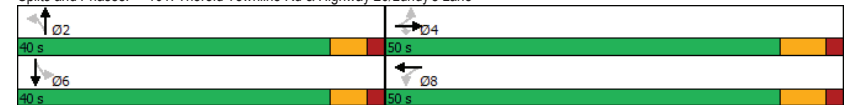
Intersection LOS: F

Intersection Capacity Utilization 146.9%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	97	911	254	70	1163	208	412	164	437
v/c Ratio	1.56	1.12	0.44	1.08	1.71	1.19	0.80	0.87	0.86
Control Delay	343.0	92.5	12.0	165.2	345.5	156.9	36.4	67.1	42.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	343.0	92.5	12.0	165.2	345.5	156.9	36.4	67.1	42.5
Queue Length 50th (m)	~25.1	~192.3	18.0	~14.3	~316.8	~46.0	61.1	26.7	68.0
Queue Length 95th (m)	#46.0	#265.8	37.6	#30.1	#396.2	#89.6	#113.7	#65.9	#126.1
Internal Link Dist (m)		912.7			557.5		759.0		193.0
Turn Bay Length (m)	90.0		20.0	55.0		20.0		20.0	
Base Capacity (vph)	62	816	577	65	682	175	513	189	507
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.56	1.12	0.44	1.08	1.71	1.19	0.80	0.87	0.86

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.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2040

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	89	838	234	64	876	194	191	273	106	151	298	104
Future Volume (vph)	89	838	234	64	876	194	191	273	106	151	298	104
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	1597	1054	1401	1318		1299	1244		1299	1235	
Flt Permitted	0.09	1.00	1.00	0.09	1.00		0.32	1.00		0.35	1.00	
Satd. Flow (perm)	123	1597	1054	128	1318		438	1244		474	1235	
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)	97	911	254	70	952	211	208	297	115	164	324	113
RTOR Reduction (vph)	0	0	39	0	9	0	0	16	0	0	14	0
Lane Group Flow (vph)	97	911	215	70	1154	0	208	396	0	164	423	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	43.0	43.0	43.0	43.0	43.0		34.0	34.0		34.0	34.0	
Effective Green, g (s)	46.0	46.0	46.0	46.0	46.0		36.0	36.0		36.0	36.0	
Actuated g/C Ratio	0.51	0.51	0.51	0.51	0.51		0.40	0.40		0.40	0.40	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	62	816	538	65	673		175	497		189	494	
v/s Ratio Prot		0.57			c0.88			0.32			0.34	
v/s Ratio Perm	0.79		0.20	0.55			c0.47			0.35		
v/c Ratio	1.56	1.12	0.40	1.08	1.72		1.19	0.80		0.87	0.86	
Uniform Delay, d1	22.0	22.0	13.5	22.0	22.0		27.0	23.8		24.8	24.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	318.3	68.6	0.5	134.4	328.0		127.9	8.7		31.7	13.7	
Delay (s)	340.3	90.6	14.0	156.4	350.0		154.9	32.5		56.5	38.3	
Level of Service	F	F	B	F	F		F	C		E	D	
Approach Delay (s)		94.3			339.1			73.5			43.3	
Approach LOS		F			F			E			D	

Intersection Summary

HCM 2000 Control Delay	163.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	146.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2040

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	49	274	55	185	230	36	56	295	139	45	406	90
Future Volume (vph)	49	274	55	185	230	36	56	295	139	45	406	90
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.980			0.989			0.962			0.977	
Flt Protected		0.994			0.980			0.994			0.996	
Satd. Flow (prot)	0	1428	0	0	1426	0	0	1341	0	0	1355	0
Flt Permitted		0.994			0.980			0.994			0.996	
Satd. Flow (perm)	0	1428	0	0	1426	0	0	1341	0	0	1355	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2106.3			714.3	
Travel Time (s)		30.1			38.7			151.7			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	53	298	60	201	250	39	61	321	151	49	441	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	411	0	0	490	0	0	533	0	0	588	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	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 117.8% ICU Level of Service H

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Total - 2040

PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↔			↔			↔			↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	49	274	55	185	230	36	56	295	139	45	406	90
Future Volume (vph)	49	274	55	185	230	36	56	295	139	45	406	90
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)	53	298	60	201	250	39	61	321	151	49	441	98
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	411	490	533	588								
Volume Left (vph)	53	201	61	49								
Volume Right (vph)	60	39	151	98								
Hadj (s)	-0.04	0.05	-0.05	0.03								
Departure Headway (s)	9.5	9.6	9.5	9.6								
Degree Utilization, x	1.09	1.31	1.41	1.57								
Capacity (veh/h)	386	382	388	389								
Control Delay (s)	103.1	184.3	224.9	291.8								
Approach Delay (s)	103.1	184.3	224.9	291.8								
Approach LOS	F	F	F	F								
Intersection Summary												
Delay		209.8										
Level of Service		F										
Intersection Capacity Utilization		117.8%		ICU Level of Service					H			
Analysis Period (min)		15										

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2040
PM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	364	992	905	265	199	267
Future Volume (vph)	364	992	905	265	199	267
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.969		0.923	
Flt Protected		0.987			0.979	
Satd. Flow (prot)	0	1194	1306	0	1267	0
Flt Permitted		0.987			0.979	
Satd. Flow (perm)	0	1194	1306	0	1267	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	396	1078	984	288	216	290
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1474	1272	0	506	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization	244.3%			ICU Level of Service H		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2040
PM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	364	992	905	265	199	267
Future Volume (veh/h)	364	992	905	265	199	267
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	396	1078	984	288	216	290
Approach Volume (veh/h)	1474	1272		506		
Crossing Volume (veh/h)	216	396		984		
High Capacity (veh/h)	1169	1014		631		
High v/c (veh/h)	1.26	1.25		0.80		
Low Capacity (veh/h)	966	826		490		
Low v/c (veh/h)	1.53	1.54		1.03		
Intersection Summary						
Maximum v/c High	1.26					
Maximum v/c Low	1.54					
Intersection Capacity Utilization	244.3%			ICU Level of Service H		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2040
PM Peak Hour

Intersection			
Intersection Delay, s/veh	182.2		
Intersection LOS	F		
Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	1474	1272	506
Demand Flow Rate, veh/h	1497	1311	535
Vehicles Circulating, veh/h	216	408	1014
Vehicles Exiting, veh/h	1333	1305	705
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	178.6	219.8	98.1
Approach LOS	F	F	F
Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	1497	1311	535
Cap Entry Lane, veh/h	1107	910	491
Entry HV Adj Factor	0.985	0.971	0.946
Flow Entry, veh/h	1474	1272	506
Cap Entry, veh/h	1090	883	464
V/C Ratio	1.352	1.440	1.091
Control Delay, s/veh	178.6	219.8	98.1
LOS	F	F	F
95th %tile Queue, veh	58	57	17

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2040
PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	82	103	189	322	440	69
Future Volume (vph)	82	103	189	322	440	69
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.925				0.982	
Flt Protected	0.978			0.982		
Satd. Flow (prot)	1315	0	0	1182	1336	0
Flt Permitted	0.978			0.982		
Satd. Flow (perm)	1315	0	0	1182	1336	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	304.3			152.9	152.0	
Travel Time (s)	21.9			11.0	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	112	205	350	478	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	201	0	0	555	553	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	103.7%			ICU Level of Service G		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2040
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	82	103	189	322	440	69
Future Volume (Veh/h)	82	103	189	322	440	69
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)	89	112	205	350	478	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				370		
pX, platoon unblocked						
vC, conflicting volume	1276	516	553			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1276	516	553			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	39	80	80			
cM capacity (veh/h)	147	559	1017			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	201	555	553			
Volume Left	89	205	0			
Volume Right	112	0	75			
cSH	249	1017	1700			
Volume to Capacity	0.81	0.20	0.33			
Queue Length 95th (m)	49.3	6.0	0.0			
Control Delay (s)	60.2	5.0	0.0			
Lane LOS	F	A				
Approach Delay (s)	60.2	5.0	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		11.4				
Intersection Capacity Utilization		103.7%		ICU Level of Service	G	
Analysis Period (min)		15				

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2040
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (vph)	3	5	9	395	504	4
Future Volume (vph)	3	5	9	395	504	4
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916				0.999	
Flt Protected	0.982			0.999		
Satd. Flow (prot)	1308	0	0	1203	1359	0
Flt Permitted	0.982			0.999		
Satd. Flow (perm)	1308	0	0	1203	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	79.3			152.0	2106.3	
Travel Time (s)	5.7			10.9	151.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	5	10	429	548	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	0	439	552	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.6			0.0	0.0	
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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 53.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2040
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	5	9	395	504	4
Future Volume (Veh/h)	3	5	9	395	504	4
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)	3	5	10	429	548	4
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	999	550	552			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	999	550	552			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	267	535	1018			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	8	439	552			
Volume Left	3	10	0			
Volume Right	5	0	4			
cSH	389	1018	1700			
Volume to Capacity	0.02	0.01	0.32			
Queue Length 95th (m)	0.5	0.2	0.0			
Control Delay (s)	14.5	0.3	0.0			
Lane LOS	B	A				
Approach Delay (s)	14.5	0.3	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization		53.3%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2040
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	38	107	83	473	445	98
Future Volume (vph)	38	107	83	473	445	98
Ideal Flow (vphpl)	1483	1483	1228	1228	1388	1388
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900				0.976	
Flt Protected	0.987			0.993		
Satd. Flow (prot)	1292	0	0	1195	1328	0
Flt Permitted	0.987			0.993		
Satd. Flow (perm)	1292	0	0	1195	1328	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	214.7			217.0	152.9	
Travel Time (s)	15.5			15.6	11.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	116	90	514	484	107
Shared Lane Traffic (%)						
Lane Group Flow (vph)	157	0	0	604	591	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	1.37	1.37	1.71	1.71	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	107.0%			ICU Level of Service G		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis 203: Thorold Townline Rd & Street C

Total - 2040
PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			W	W	
Traffic Volume (veh/h)	38	107	83	473	445	98
Future Volume (Veh/h)	38	107	83	473	445	98
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)	41	116	90	514	484	107
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (m)			217			
pX, platoon unblocked						
vC, conflicting volume	1232	538	591			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1232	538	591			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	77	79	91			
cM capacity (veh/h)	178	544	985			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	157	604	591			
Volume Left	41	90	0			
Volume Right	116	0	107			
cSH	354	985	1700			
Volume to Capacity	0.44	0.09	0.35			
Queue Length 95th (m)	17.6	2.4	0.0			
Control Delay (s)	23.1	2.4	0.0			
Lane LOS	C	A				
Approach Delay (s)	23.1	2.4	0.0			
Approach LOS	C					
Intersection Summary						
Average Delay		3.7				
Intersection Capacity Utilization		107.0%		ICU Level of Service	G	
Analysis Period (min)		15				

Thorold Townline & Highway 20, Thorold
PTSL (210565)

Synchro 11 Report
Page 15

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.6.541 [19821,26/11/2015]

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Filename: Barker and Hwy 20.arc8
Path: C:\Users\AdamMorrison\OneDrive - Paradigm\Desktop\Projects\210565 - Arcady
Report generation date: 2023-11-22 8:02:09 PM

Summary of intersection performance

	PM						
	Queue (PCE)	95% Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
A1 - TT 2040							
Intersection 1 - Leg North	2.21	5.27	15.89	0.68	C		
Intersection 1 - Leg West	260.98	203.06	799.33	1.36	F	550.90	F
Intersection 1 - Leg East	137.78	206.00	476.05	1.23	F		
Intersection 2 - Leg North	0.56	1.05	3.96	0.35	A		
Intersection 2 - Leg West	2.76	4.06	6.75	0.73	A	6.03	A
Intersection 2 - Leg East	2.14	3.09	6.03	0.68	A		
Intersection 3 - Leg North	0.25	~1	4.05	0.20	A		
Intersection 3 - Leg West	8.23	29.44	20.97	0.90	C	12.85	B
Intersection 3 - Leg East	1.90	2.06	6.94	0.65	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 - Existing, AM" model duration: 8:00 AM - 9:30 AM
"D2 - Existing, PM" model duration: 4:00 PM - 5:30 PM
"D3 - BG 2030, AM" model duration: 8:00 AM - 9:30 AM
"D4 - BG 2030, PM" model duration: 4:00 PM - 5:30 PM
"D5 - BG 2035, AM" model duration: 8:00 AM - 9:30 AM
"D6 - BG 2035, PM" model duration: 4:00 PM - 5:30 PM
"D7 - BG 2040, AM" model duration: 8:00 AM - 9:30 AM
"D8 - BG 2040, PM" model duration: 4:00 PM - 5:30 PM
"D9 - TT 2030, AM" model duration: 8:00 AM - 9:30 AM
"D10 - TT 2030, PM" model duration: 4:00 PM - 5:30 PM
"D11 - TT 2035, AM" model duration: 8:00 AM - 9:30 AM
"D12 - TT 2035, PM" model duration: 4:00 PM - 5:30 PM
"D13 - TT 2040, AM" model duration: 8:00 AM - 9:30 AM
"D14 - TT 2040, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.6.541 at 2023-11-22 8:02:08 PM

File summary

Title	(untitled)
Location	
Site Number	
Date	2023-11-22
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	AdamMorrison
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)
7.50	✓		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	km/h	PCE	PCE	perHour	s	-Min	perMin

file:///C:/Users/AdamMorrison/OneDrive%20-%20Paradigm/Desktop/Projects/210565%... 2023-11-22

(Default Analysis Set) - TT 2040, PM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
TT 2040, PM	TT 2040	PM		ONE HOUR	16:00	17:30	90	15				✓		

Intersection Network

Intersections

Junction	Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Do Geometric Delay	Intersection Delay (s)	Intersection LOS
1	1	Single Lane	Roundabout	North,West,East				550.90	F
2	2	Dual Lane	Roundabout	North,West,East				6.03	A
3	3	Single Lane - Channelized Rights	Roundabout	North,West,East				12.85	B

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Intersection	Leg	Leg	Name	Description
1	North	North	Barker Pkwy	
1	West	West	Hwy 20	
1	East	East	Hwy 20	
2	North	North	Barker Pkwy	
2	West	West	Hwy 20	
2	East	East	Hwy 20	
3	North	North	Barker Pkwy	
3	West	West	Hwy 20	
3	East	East	Hwy 20	

Capacity Options

Intersection	Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	North	0.00	99999.00		0.00
1	West	0.00	99999.00		0.00
1	East	0.00	99999.00		0.00
2	North	0.00	99999.00		0.00
2	West	0.00	99999.00		0.00
2	East	0.00	99999.00		0.00
3	North	0.00	99999.00		0.00
3	West	0.00	99999.00		0.00
3	East	0.00	99999.00		0.00

Roundabout Geometry

Intersection	Leg	V - Approach road half-width (m)	E - Entry width (m)	F - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	North	3.50	4.50	30.00	20.00	40.00	25.00	
1	West	3.50	4.50	30.00	20.00	40.00	25.00	
1	East	3.50	4.50	30.00	20.00	40.00	25.00	
2	North	7.00	8.00	30.00	20.00	55.00	25.00	
2	West	7.00	8.00	30.00	20.00	55.00	25.00	
2	East	7.00	8.00	30.00	20.00	55.00	25.00	
3	North	3.50	8.00	30.00	20.00	40.00	25.00	
3	West	3.50	8.00	30.00	20.00	40.00	25.00	
3	East	3.50	8.00	30.00	20.00	40.00	25.00	

Bypass

Intersection	Leg	Leg Has Bypass	Bypass Utilisation (%)
1	North		
1	West		
1	East		
2	North		
2	West		
2	East		
3	North	✓	100
3	West		
3	East	✓	100

Slope / Intercept / Capacity

Leg Intercept Adjustments

Intersection	Leg	Type	Reason	Direct Intercept Adjustment (PCE/hr)	Percentage Intercept Adjustment (%)
1	North	Percentage			90.00
1	West	Percentage			90.00
1	East	Percentage			90.00
2	North	Percentage			90.00
2	West	Percentage			90.00
2	East	Percentage			90.00
3	North	Percentage			90.00
3	West	Percentage			90.00
3	East	Percentage			90.00

Roundabout Slope and Intercept used in model

Intersection	Leg	Enter slope and intercept directly	Entered slope (calculated)	Entered intercept (PCE/hr) (calculated)	Final Slope	Final Intercept (PCE/hr)
1	North		(calculated)	(calculated)	0.579	1221.701
1	West		(calculated)	(calculated)	0.579	1221.701
1	East		(calculated)	(calculated)	0.579	1221.701
2	North		(calculated)	(calculated)	0.723	2192.710
2	West		(calculated)	(calculated)	0.723	2192.710
2	East		(calculated)	(calculated)	0.723	2192.710
3	North		(calculated)	(calculated)	0.710	1814.551
3	West		(calculated)	(calculated)	0.710	1814.551
3	East		(calculated)	(calculated)	0.710	1814.551

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

Intersection	Leg	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
1	North	ONE HOUR	✓	466.00	100.000
1	West	ONE HOUR	✓	1356.00	100.000
1	East	ONE HOUR	✓	1170.00	100.000
2	North	ONE HOUR	✓	466.00	100.000

2	West	ONE HOUR	✓	1356.00	100.000
2	East	ONE HOUR	✓	1170.00	100.000
3	North	ONE HOUR	✓	466.00	100.000
3	West	ONE HOUR	✓	1366.00	100.000
3	East	ONE HOUR	✓	1170.00	100.000

Turning Proportions

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

From	To			
	North	West	East	
North	0.000	267.000	199.000	
West	364.000	0.000	992.000	
East	265.000	905.000	0.000	

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

From	To			
	North	West	East	
North	0.00	0.57	0.43	
West	0.27	0.00	0.73	
East	0.23	0.77	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.000	267.000	199.000	
West	364.000	0.000	992.000	
East	265.000	905.000	0.000	

Turning Proportions (PCE) - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.00	0.57	0.43	
West	0.27	0.00	0.73	
East	0.23	0.77	0.00	

Turning Counts / Proportions (PCE/hr) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.000	267.000	199.000	
West	364.000	0.000	992.000	
East	265.000	905.000	0.000	

Turning Proportions (PCE) - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.00	0.57	0.43	
West	0.27	0.00	0.73	
East	0.23	0.77	0.00	

Vehicle Mix

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

From	To			
	North	West	East	
North	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 1 (for whole period)

From	To			
	North	West	East	
North	0.0	10.0	0.0	
West	3.0	0.0	1.0	

	East	3.0	3.0	0.0

Average PCE Per Vehicle - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 2 (for whole period)

From	To			
	North	West	East	
North	0.0	10.0	0.0	
West	3.0	0.0	1.0	
East	3.0	3.0	0.0	

Average PCE Per Vehicle - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	1.000	1.100	1.000	
West	1.030	1.000	1.010	
East	1.030	1.030	1.000	

Truck Percentages - Intersection 3 (for whole period)

From	To			
	North	West	East	
North	0.0	10.0	0.0	
West	3.0	0.0	1.0	
East	3.0	3.0	0.0	

Results

Results Summary for whole modelled period

Intersection	Log	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS	Average Demand (PCE/hr)	Total Intersection Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Total Queueing Delay (PCE-min)	Inclusive Average Queueing Delay (s)
1	North	0.68	15.89	2.21	5.27	C	427.61	641.41	126.85	11.87	1.41	126.88	11.87
1	West	1.36	799.33	260.98	203.06	F	1244.29	1866.43	11935.20	383.68	132.61	13378.79	430.09
1	East	1.23	476.05	137.78	206.00	F	1073.61	1610.42	6358.20	236.89	70.65	6635.90	247.24
2	North	0.35	3.96	0.56	1.05	A	427.61	641.41	36.06	3.37	0.40	36.06	3.37
2	West	0.73	6.75	2.76	4.06	A	1244.29	1866.43	153.21	4.93	1.70	153.23	4.93
2	East	0.68	6.03	2.14	3.09	A	1073.61	1610.42	122.65	4.57	1.36	122.66	4.57
3	North	0.20	4.05	0.25	~1	A	427.61	273.91	16.17	3.54	0.18	16.17	3.54
3	West	0.90	20.97	8.23	29.44	C	1244.29	1866.43	342.63	11.01	3.81	342.67	11.02
3	East	0.65	6.94	1.90	2.06	A	1073.61	1245.67	110.41	5.32	1.23	110.42	5.32

Main Results for each time segment

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

Intersection	Log	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	350.83		87.71			347.82	462.03	667.85	0.00	835.18	746.91	0.420	0.00	0.75	7.748	A
1	West	1020.87		255.22			962.69	867.13	149.53	0.00	1135.74	1037.10	0.999	0.00	7.05	22.989	C
1	East	880.84		220.21			863.41	874.74	266.47	0.00	1067.48	1060.58	0.825	0.00	4.36	16.060	C
2	North	350.83		87.71			349.74	471.77	678.83	0.00	1701.95	1165.45	0.206	0.00	0.27	2.805	A
2	West	1020.87		255.22			1017.00	879.22	149.35	0.00	2084.74	1832.90	0.490	0.00	0.97	3.410	A
2	East	880.84		220.21			877.60	893.35	273.00	0.00	1995.35	1837.01	0.441	0.00	0.81	3.308	A
3	North	350.83	149.82	37.45	201.01	199.51	149.31	272.44	678.37	0.00	1332.72	703.76	0.112	0.00	0.13	3.040	A
3	West	1020.87	1020.87	255.22	0.00	201.01	1014.93	678.37	149.31	0.00	1708.50	1314.69	0.598	0.00	1.49	5.227	A
3	East	880.84	681.33	170.33	199.51	0.00	678.37	891.79	272.44	0.00	1621.04	1563.89	0.420	0.00	0.74	3.922	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	418.92		104.73			417.07	522.57	775.07	0.00	773.12	746.91	0.542	0.75	1.22	10.610	B
1	West	1219.02		304.75			1101.26	1014.03	178.10	0.00	1118.62	1037.10	1.090	7.05	36.49	84.033	F
1	East	1051.81		262.95			1002.02	983.74	295.62	0.00	1050.61	1060.58	1.001	4.36	16.80	50.452	F
2	North	418.92		104.73			418.53	564.60	812.41	0.00	1605.38	1165.45	0.261	0.27	0.37	3.200	A
2	West	1219.02		304.75			1217.09	1052.21	178.73	0.00	2063.50	1832.90	0.591	0.97	1.45	4.309	A
2	East	1051.81		262.95			1050.30	1069.11	326.71	0.00	1956.51	1837.01	0.538	0.81	1.19	4.085	A
3	North	418.92	178.90	44.72	240.03	238.23	178.73	326.07	812.23	0.00	1237.64	703.76	0.145	0.13	0.17	3.399	A
3	West	1219.02	1219.02	304.75	0.00	240.03	1214.70	812.23	178.73	0.00	1687.60	1314.69	0.722	1.49	2.56	7.658	A
3	East	1051.81	813.58	203.39	238.23	0.00	812.23	1067.36	326.07	0.00	1582.95	1563.89	0.514	0.74	1.08	4.802	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	513.08		128.27			509.34	531.38	810.82	0.00	752.43	746.91	0.682	1.22	2.15	15.383	C
1	West	1492.98		373.25			1095.06	1102.65	217.51	0.00	1095.82	1037.10	1.362	36.49	135.97	291.514	F
1	East	1288.19		322.05			1048.24	1018.61	293.95	0.00	1051.57	1060.58	1.225	16.80	76.79	171.558	F
2	North	513.08		128.27			512.32	690.33	993.56	0.00	1474.42	1165.45	0.348	0.37	0.56	3.941	A
2	West	1492.98		373.25			1487.88	1287.10	218.79	0.00	2034.54	1832.90	0.734	1.45	2.73	6.624	A
2	East	1288.19		322.05			1284.49	1307.26	399.40	0.00	1903.96	1837.01	0.577	1.19	2.11	5.960	A
3	North	513.08	219.10	54.78	293.97	291.77	218.80	395.37	993.25	0.00	1109.06	703.76	0.198	0.17	0.24	4.043	A
3	West	1492.98	1492.98	373.25	0.00	293.97	1472.85	993.25	218.80	0.00	1659.14	1314.69	0.900	2.56	7.60	17.945	C
3	East	1288.19	996.42	249.11	291.77	0.00	993.25	1296.28	395.37	0.00	1533.73	1563.89	0.650	1.08	1.87	6.819	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	513.08		128.27			512.84	531.96	813.02	0.00	751.16	746.91	0.683	2.15	2.21	15.893	C
1	West	1492.98		373.25			1094.83	1106.85	219.00	0.00	1094.95	1037.10	1.364	135.97	235.51	611.436	F
1	East	1288.19		322.05			1051.09	1019.93	293.89	0.00	1051.61	1060.58	1.225	76.79	136.07	372.254	F
2	North	513.08		128.27			513.06	692.48	996.35	0.00	1472.40	1165.45	0.348	0.56	0.56	3.958	A
2	West	1492.98		373.25			1492.84	1290.32	219.10	0.00	2034.31	1832.90	0.734	2.73	2.76	6.745	A
2	East	1288.19		322.05			1288.10	1311.20	400.73	0.00	1903.00	1837.01	0.577	2.11	2.14	6.028	A
3	North	513.08	219.10	54.78	293.97	291.77	219.10	400.09	996.31	0.00	1106.89	703.76	0.198	0.24	0.25	4.054	A
3	West	1492.98	1492.98	373.25	0.00	293.97	1490.46	996.31	219.10	0.00	1658.93	1314.69	0.900	7.60	8.23	20.966	C
3	East	1288.19	996.42	249.11	291.77	0.00	996.31	1309.46	400.09	0.00	1530.37	1563.89	0.651	1.87	1.90	6.940	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	418.92		104.73			422.35	536.55	808.28	0.00	753.90	746.91	0.556	2.21	1.35	11.572	B
1	West	1219.02		304.75			1117.11	1050.27	180.36	0.00	1117.32	1037.10	1.091	235.51	260.98	799.333	F
1	East	1051.81		262.95			1044.95	997.60	299.87	0.00	1048.15	1060.58	1.003	136.07	137.78	476.051	F
2	North	418.92		104.73			419.67	567.67	816.44	0.00	1602.47	1165.45	0.261	0.56	0.38	3.214	A
2	West	1219.02		304.75			1224.13	1056.89	179.22	0.00	2063.15	1832.90	0.591	2.76	1.48	4.383	A
2	East	1051.81		262.95			1055.50	1074.75	328.60	0.00	1955.10	1837.01	0.538	2.14	1.21	4.138	A
3	North	418.92	178.90	44.72	240.03	238.23	179.20	333.14	816.74	0.00	1234.44	703.76	0.145	0.25	0.17	3.411	A
3	West	1219.02	1219.02	304.75	0.00	240.03	1241.04	816.74	179.20	0.00	1687.27	1314.69	0.722	8.23	2.72	8.572	A
3	East	1051.81	813.58	203.39	238.23	0.00	816.74	1087.10	333.14	0.00	1577.93	1563.89	0.516	1.90	1.11	4.892	A

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

Intersection	Leg	Total Demand (PCE/hr)	Intersection Demand (PCE/hr)	Intersection Arrivals (PCE)	Bypass Demand (PCE/hr)	Bypass Exit Flow (PCE/hr)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	V/C Ratio	Start Queue (PCE)	End Queue (PCE)	Delay (s)	LOS
1	North	350.83		87.71			352.53	538.56	803.17	0.00	756.86	746.91	0.464	1.35	0.93	9.432	A
1	West	1020.87		255.22			1130.17	1005.16	150.55	0.00	1134.57	1037.10	0.900	260.98	233.66	788.061	F
1	East	880.84		220.21			1038.35	977.34	303.38	0.00	1046.12	1060.58	0.842	137.78	98.40	410.486	F
2	North	350.83		87.71			351.23	474.44	682.54	0.00	1699.27	1165.45	0.206	0.38	0.28	2.819	A
2	West	1020.87		255.22			1022.87	883.78	149.99	0.00	2084.28	1832.90	0.490	1.48	0.98	3.451	A
2	East	880.84		220.21			882.40	898.28	274.58	0.00	1994.21	1837.01	0.442	1.21	0.82	3.341	A
3	North	350.83	149.82	37.45	201.01	199.51	149.99	275.32	682.75	0.00	1320.61	703.76	0.113	0.17	0.13	3.053	A
3	West	1020.87	1020.87	255.22	0.00	201.01	1025.65	682.75	149.99	0.00	1708.02	1314.69	0.598	2.72	1.53	6.394	A
3	East	880.84	681.33	170.33	199.51	0.00	682.75	900.31	275.32	0.00	1619.00	1563.89	0.421	1.11	0.75	3.967	A

Queueing Delay Results for each time segment

Queueing Delay results: (16:00-16:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	10.77		7.748	A	A
1	West	83.77		5.58	C	C
1	East	55.79		3.72	C	B
2	North	4.02		0.27	A	A
2	West	14.10		0.94	A	A
2	East	11.82		0.79	A	A
3	North	1.86		0.12	A	A
3	West	21.30		1.42	A	A
3	East	10.81		0.72	A	A

Queueing Delay results: (16:15-16:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	17.38	1.16	10.610	B	B
1	West	337.92	22.53	84.033	F	F
1	East	175.88	11.73	50.452	F	D
2	North	5.48	0.37	3.200	A	A
2	West	21.11	1.41	4.309	A	A
2	East	17.34	1.16	4.085	A	A
3	North	2.49	0.17	3.399	A	A
3	West	36.34	2.42	7.658	A	A
3	East	15.73	1.05	4.802	A	A

Queueing Delay results: (16:30-16:45)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	29.83	1.99	15.383	C	B
1	West	1293.95	86.26	291.514	F	F
1	East	794.58	46.97	171.558	F	F
2	North	8.22	0.55	3.941	A	A
2	West	38.65	2.58	6.624	A	A
2	East	30.27	2.02	5.950	A	A
3	North	3.61	0.24	4.043	A	A
3	West	95.45	6.36	17.945	C	B
3	East	26.78	1.79	6.819	A	A

Queueing Delay results: (16:45-17:00)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	32.82	2.19	15.893	C	B
1	West	2786.09	185.74	611.436	F	F
1	East	1596.65	106.44	372.254	F	F
2	North	8.42	0.56	3.958	A	A
2	West	41.21	2.75	6.745	A	A
2	East	31.90	2.13	6.028	A	A
3	North	3.68	0.25	4.054	A	A
3	West	119.55	7.97	20.966	C	C
3	East	28.33	1.89	6.940	A	A

Queueing Delay results: (17:00-17:15)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	21.53	1.44	11.572	B	B
1	West	3723.68	248.25	799.333	F	F
1	East	2053.91	136.93	476.051	F	F
2	North	5.73	0.38	3.214	A	A
2	West	23.06	1.54	4.383	A	A
2	East	18.74	1.25	4.138	A	A
3	North	2.59	0.17	3.411	A	A
3	West	46.08	3.07	8.572	A	A
3	East	17.19	1.15	4.892	A	A

Queueing Delay results: (17:15-17:30)

Intersection	Leg	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	North	14.52	0.97	9.432	A	A
1	West	3709.79	247.32	788.061	F	F
1	East	1771.40	118.09	410.486	F	F
2	North	4.19	0.28	2.819	A	A
2	West	15.08	1.01	3.451	A	A

2	East	12.57		0.84		3.341		A		A
3	North	1.94		0.13		3.053		A		A
3	West	23.90		1.59		5.394		A		A
3	East	11.58		0.77		3.967		A		A

Queue Variation Results for each time segment

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.75	~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
1	West	7.05	0.00	0.00	2.03	18.28			N/A	N/A
1	East	4.36	0.00	0.00	9.27	16.48			N/A	N/A
2	North	0.27	~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
2	West	0.97	~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
2	East	0.81	~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
3	North	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
3	West	1.49	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	East	0.74	~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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.22	0.00	0.00	1.05	2.11			N/A	N/A
1	West	36.49	0.00	19.29	91.38	124.88			N/A	N/A
1	East	16.80	0.00	9.27	40.17	54.59			N/A	N/A
2	North	0.37	~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
2	West	1.45	0.00	0.00	3.05	4.06			N/A	N/A
2	East	1.19	0.00	0.00	2.06	3.09			N/A	N/A
3	North	0.17	~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
3	West	2.56	0.00	0.00	5.08	9.14			N/A	N/A
3	East	1.08	0.00	0.00	1.03	2.06			N/A	N/A

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

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	2.15	0.00	0.00	0.00	5.27			N/A	N/A
1	West	135.97	62.95	128.94	>199	>199			N/A	N/A
1	East	76.79	35.02	72.10	114.33	128.75			N/A	N/A
2	North	0.56	~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
2	West	2.73	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	2.11	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.24	~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
3	West	7.60	0.00	0.00	15.23	29.44			N/A	N/A
3	East	1.87	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	2.21	0.00	0.00	0.00	3.16			N/A	N/A
1	West	235.51	149.25	>199	>199	>199			N/A	N/A
1	East	136.07	79.31	131.84	185.40	>199			N/A	N/A
2	North	0.56	0.00	0.00	0.00	1.05			N/A	N/A
2	West	2.76	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
2	East	2.14	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
3	North	0.25	~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
3	West	8.23	0.00	0.00	9.14	28.43			N/A	N/A
3	East	1.90	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	1.35	0.00	0.00	2.11	3.16			N/A	N/A
1	West	260.98	166.51	>199	>199	>199			N/A	N/A
1	East	137.78	73.13	131.84	195.70	>199			N/A	N/A
2	North	0.38	~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
2	West	1.48	0.00	0.00	2.03	3.05			N/A	N/A
2	East	1.21	0.00	0.00	1.03	2.06			N/A	N/A
3	North	0.17	~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
3	West	2.72	0.00	0.00	5.08	9.14			N/A	N/A
3	East	1.11	?	?	?	?	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)

Intersection	Leg	Mean (PCE)	Q05 (PCE)	Q50 (PCE)	Q90 (PCE)	Q95 (PCE)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
1	North	0.93	0.00	0.00	1.05	2.11			N/A	N/A
1	West	233.66	135.03	>199	>199	>199			N/A	N/A
1	East	98.40	36.05	90.64	158.62	182.31			N/A	N/A
2	North	0.28	~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
2	West	0.98	0.00	0.00	1.02	2.03			N/A	N/A
2	East	0.82	0.00	0.00	1.03	1.03			N/A	N/A
3	North	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
3	West	1.53	0.00	0.00	2.03	5.08			N/A	N/A
3	East	0.75	0.00	0.00	1.03	1.03			N/A	N/A

Queuing and Blocking Report

Total - 2040
PM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	TR	L	TR
Maximum Queue (m)	85.8	145.2	70.0	134.9	586.7	70.0	710.5	69.9	201.8
Average Queue (m)	42.5	76.5	34.0	74.5	575.6	64.4	482.1	56.6	125.4
95th Queue (m)	88.6	128.2	77.1	179.4	596.2	86.3	967.4	87.3	239.9
Link Distance (m)	902.3				568.8		768.8		197.7
Upstream Blk Time (%)					96		36		20
Queuing Penalty (veh)					0		0		112
Storage Bay Dist (m)	90.0		20.0		55.0		20.0		20.0
Storage Blk Time (%)	5		40		4		61		79
Queuing Penalty (veh)	50		128		38		39		298

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	119.3	264.1	161.1	633.5
Average Queue (m)	51.4	149.8	65.6	383.4
95th Queue (m)	116.2	347.4	157.7	706.2
Link Distance (m)	410.2	524.9	2084.4	705.9
Upstream Blk Time (%)	2		9	
Queuing Penalty (veh)	0		0	
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (m)	1009.0	241.2	84.8
Average Queue (m)	962.6	113.4	33.4
95th Queue (m)	1163.6	234.7	69.9
Link Distance (m)	993.2	902.3	445.5
Upstream Blk Time (%)	63		
Queuing Penalty (veh)	0		
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report

Total - 2040
PM Peak Hour

Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	168.0	43.0	102.4
Average Queue (m)	71.4	15.1	30.0
95th Queue (m)	233.6	35.1	118.7
Link Distance (m)	295.6	135.8	134.9
Upstream Blk Time (%)	11	8	
Queuing Penalty (veh)	0	42	
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	9.0	14.0	178.7
Average Queue (m)	2.6	0.8	36.3
95th Queue (m)	9.1	5.7	200.0
Link Distance (m)	70.5	134.9	2084.4
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (m)	159.1	38.4	130.6
Average Queue (m)	56.1	9.2	44.2
95th Queue (m)	164.2	27.3	144.6
Link Distance (m)	204.4	197.7	135.8
Upstream Blk Time (%)	8	13	
Queuing Penalty (veh)	0	70	
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1184

Appendix H

Traffic Control Signal Warrants



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



Horizon Year: Background 2030
Region/City/Township: Thorold, Niagara Region

Major Street: Thorold Townline Road
Minor Street: Beaverdams Road

North/South?: Y

Number of Approach Lanes: 1
Tee Intersection?: N
Flow Conditions: Free

PM Forecast Only? N

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

Time Period	Major Street						Minor Street						Peds Crossing Main Road
	Thorold Townline Road						Beaverdams Road						
	Northbound			Southbound			Eastbound			Westbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	33	241	83	15	154	34	39	103	30	76	165	3	0
PM Peak Hour	45	212	93	37	288	75	41	226	44	121	191	30	0
Average Hourly Volume	20	113	44	13	111	27	20	82	19	49	89	8	0

Warrant	AHV
1A - All	595
1B - Minor	267
2A - Major	328
2B - Cross	158

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	All Approaches	480	720	600	900	
% Fulfilled						123.9%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Minor Street Approaches	120	170	120	170	
% Fulfilled						222.7%

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Major Street Approaches	480	720	600	900	
% Fulfilled						68.2%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Traffic Crossing Major Street	50	75	50	75	
% Fulfilled						316.5%

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



Horizon Year: Total 2040
Region/City/Township: Thorold, Niagara Region

Major Street: Thorold Townline Road
Minor Street: Street A

North/South?: Y

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

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

Time Period	Major Street						Minor Street						Peds Crossing Main Road
	Thorold Townline Road						Street A						
	Northbound			Southbound			Eastbound			Westbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	64	302			203	30	71		91				
PM Peak Hour	189	322			440	69	82		103				
Average Hourly Volume	63	156	0	0	161	25	38	0	49	0	0	0	0

Warrant	AHV
1A - All	492
1B - Minor	87
2A - Major	405
2B - Cross	38

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	All Approaches	480	720	600	900	
% Fulfilled						102.4%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Minor Street Approaches	180	255	180	255	
% Fulfilled						48.2%

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Major Street Approaches	480	720	600	900	
% Fulfilled						84.3%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Traffic Crossing Major Street	50	75	50	75	
% Fulfilled						76.5%

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



Horizon Year: Total 2040
Region/City/Township: Thorold, Niagara Region

Major Street: Thorold Townline Road
Minor Street: Street B

North/South?: Y

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

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

Time Period	Major Street						Minor Street						Peds Crossing Main Road
	Thorold Townline Road						Street B						
	Northbound			Southbound			Eastbound			Westbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	3	370			225	1	4		8				
PM Peak Hour	9	395			504	4	3		5				
Average Hourly Volume	3	191	0	0	182	1	2	0	3	0	0	0	0

Warrant	AHV
1A - All	383
1B - Minor	5
2A - Major	378
2B - Cross	2

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	All Approaches	480	720	600	900	
% Fulfilled						79.7%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Minor Street Approaches	180	255	180	255	
% Fulfilled						2.8%

Warrant 2 - Delay To Cross Traffic

2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Major Street Approaches	480	720	600	900	
% Fulfilled						78.7%

2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Traffic Crossing Major Street	50	75	50	75	
% Fulfilled						3.5%

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



Horizon Year: Total 2040
Region/City/Township: Thorold, Niagara Region

Major Street: Thorold Townline Road
Minor Street: Street C

North/South?: Y

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

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	

Time Period	Major Street						Minor Street						Peds Crossing Main Road
	Thorold Townline Road						Street C						
	Northbound			Southbound			Eastbound			Westbound			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM Peak Hour	34	318			272	22	48		138				
PM Peak Hour	83	473			445	98	38		107				
Average Hourly Volume	29	198	0	0	179	30	22	0	61	0	0	0	0

Warrant	AHV
1A - All	519
1B - Minor	83
2A - Major	436
2B - Cross	22

Warrant 1 - Minimum Vehicular Volume

1A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	All Approaches	480	720	600	900	
% Fulfilled						108.1%

1B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Minor Street Approaches	180	255	180	255	
% Fulfilled						46.0%

Warrant 2 - Delay To Cross Traffic

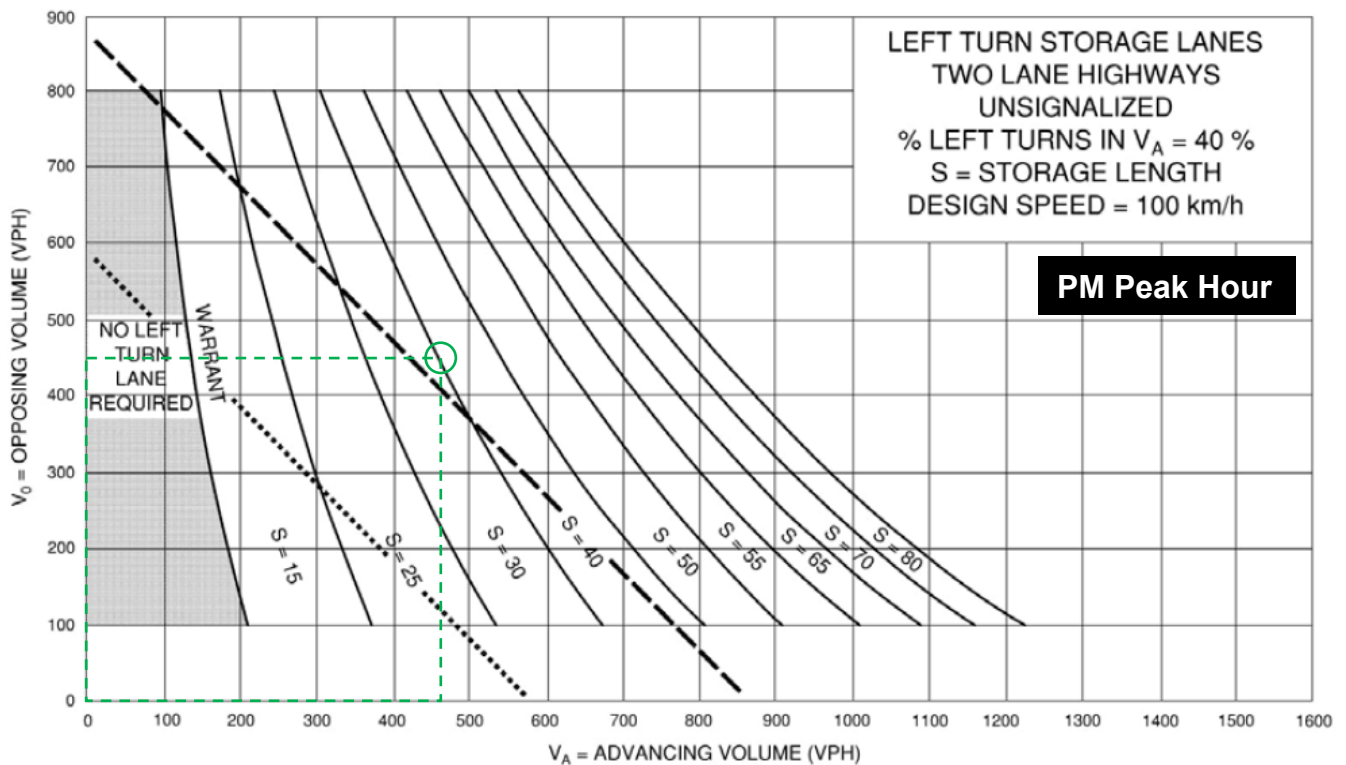
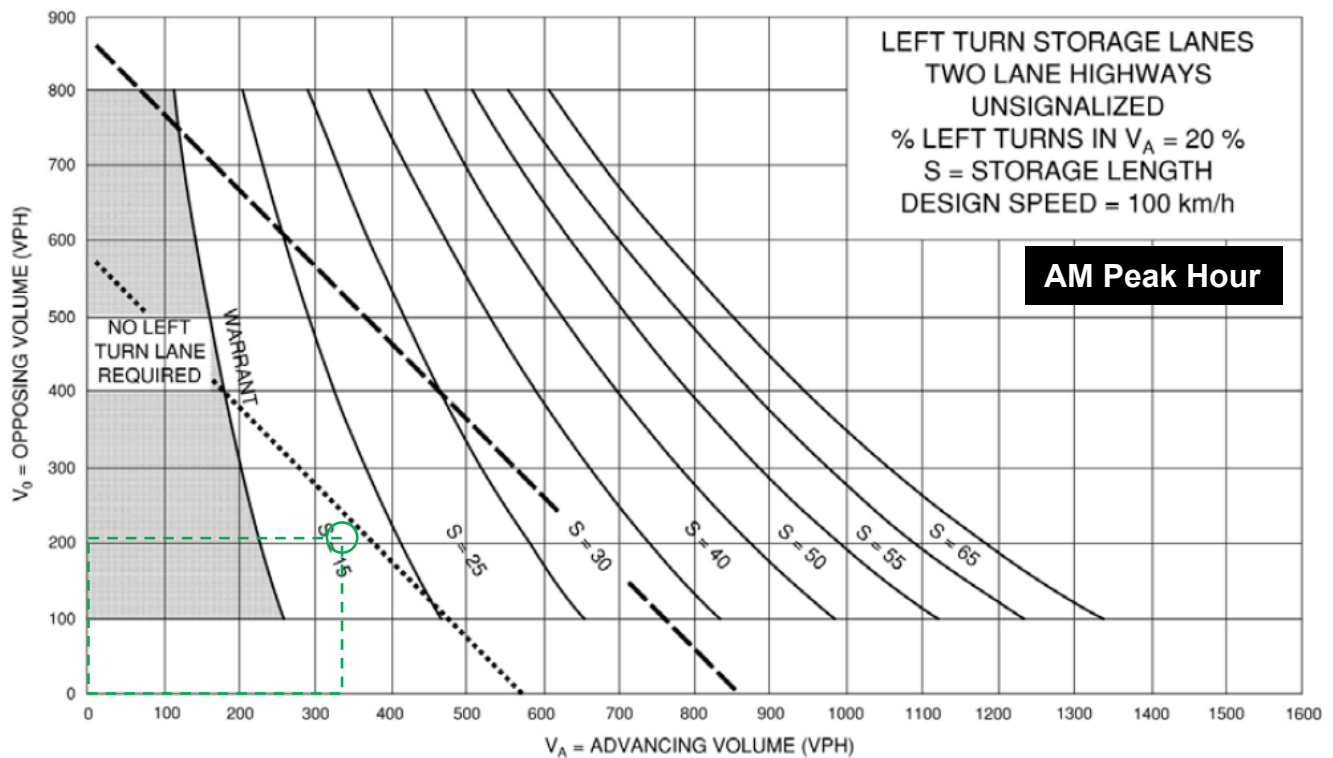
2A	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Major Street Approaches	480	720	600	900	
% Fulfilled						90.9%

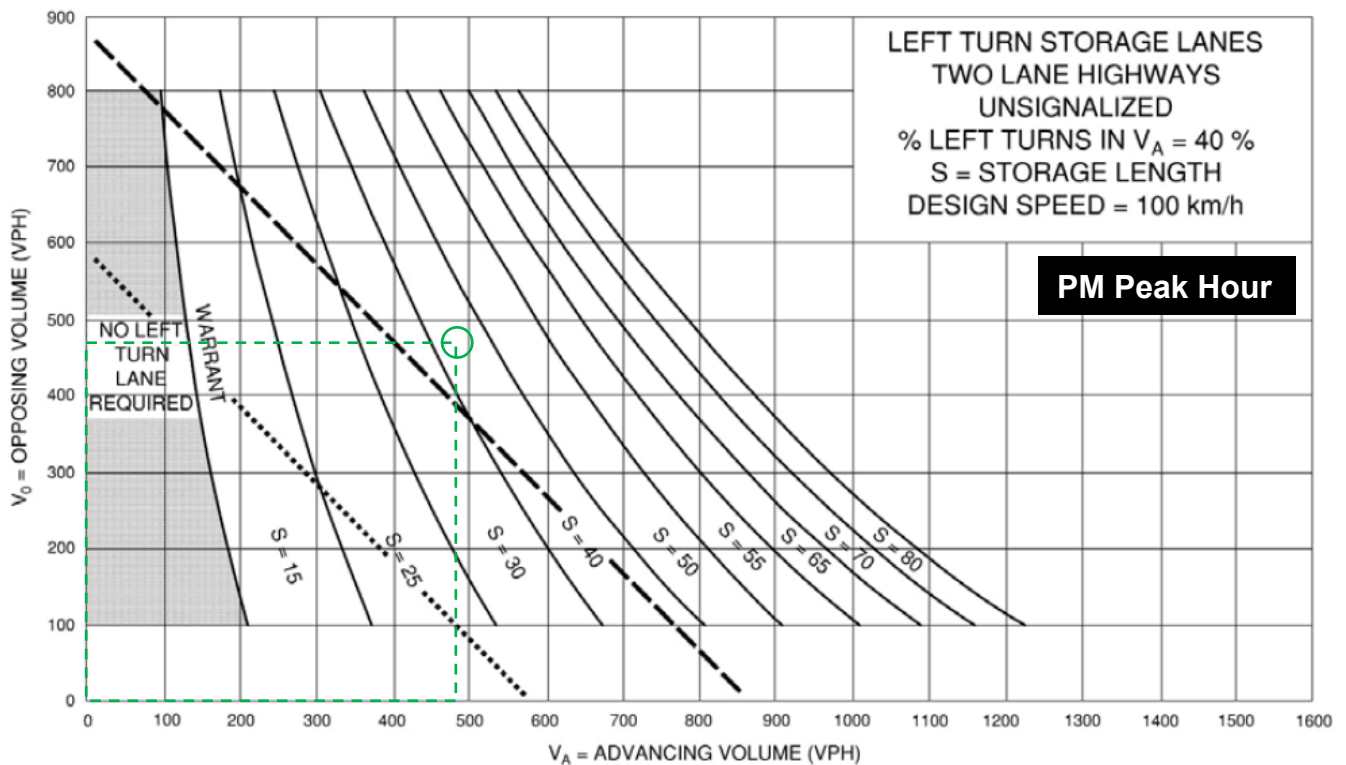
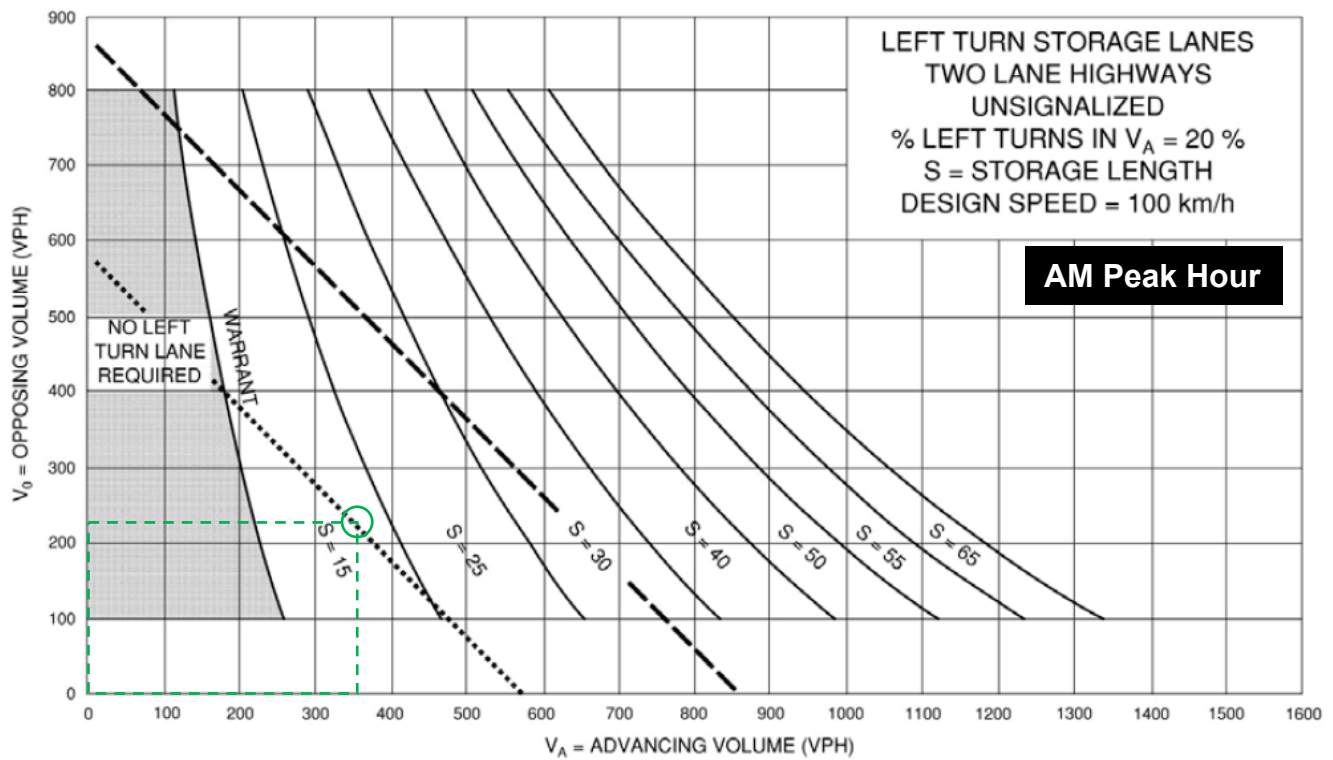
2B	Approach Lanes	1		2 or more		Average Hourly Volume
	Flow Conditions	Free	Restricted	Free	Restricted	
		X				
	Traffic Crossing Major Street	50	75	50	75	
% Fulfilled						43.0%

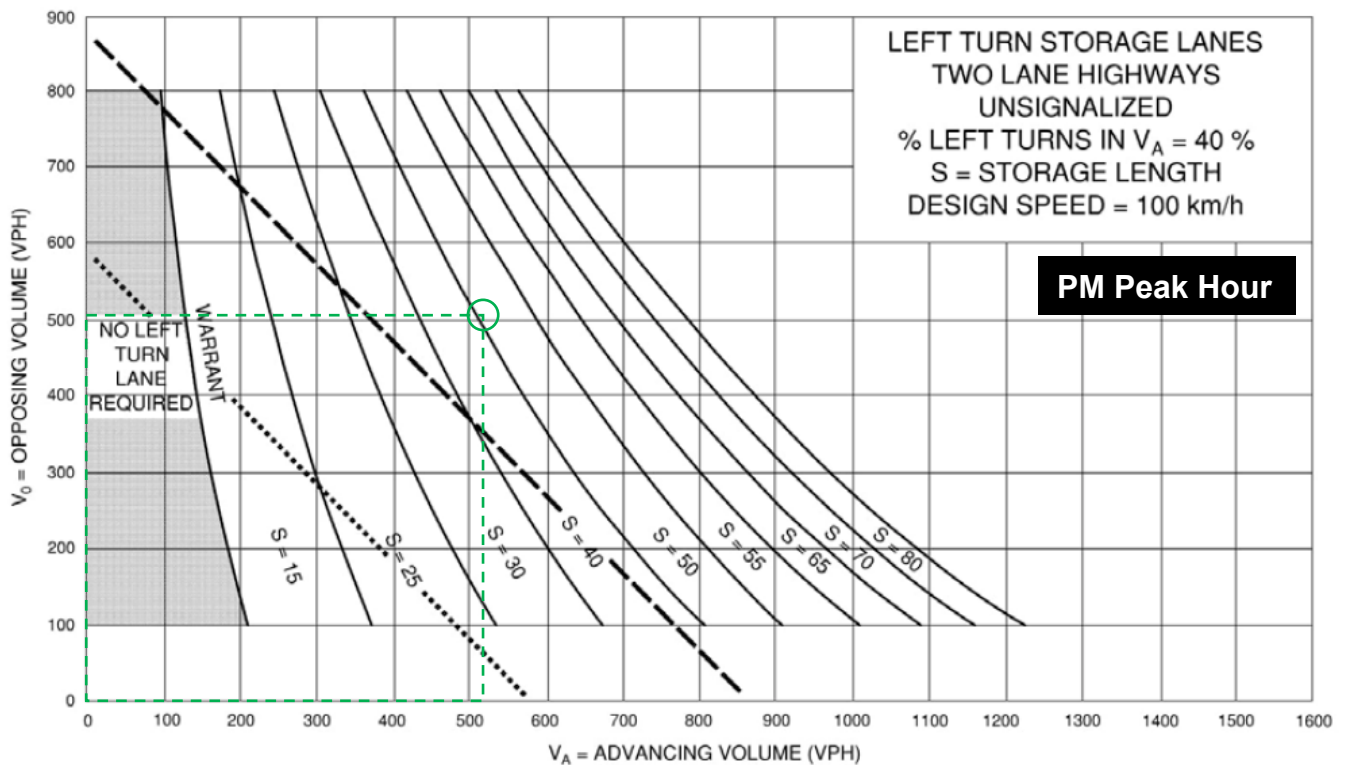
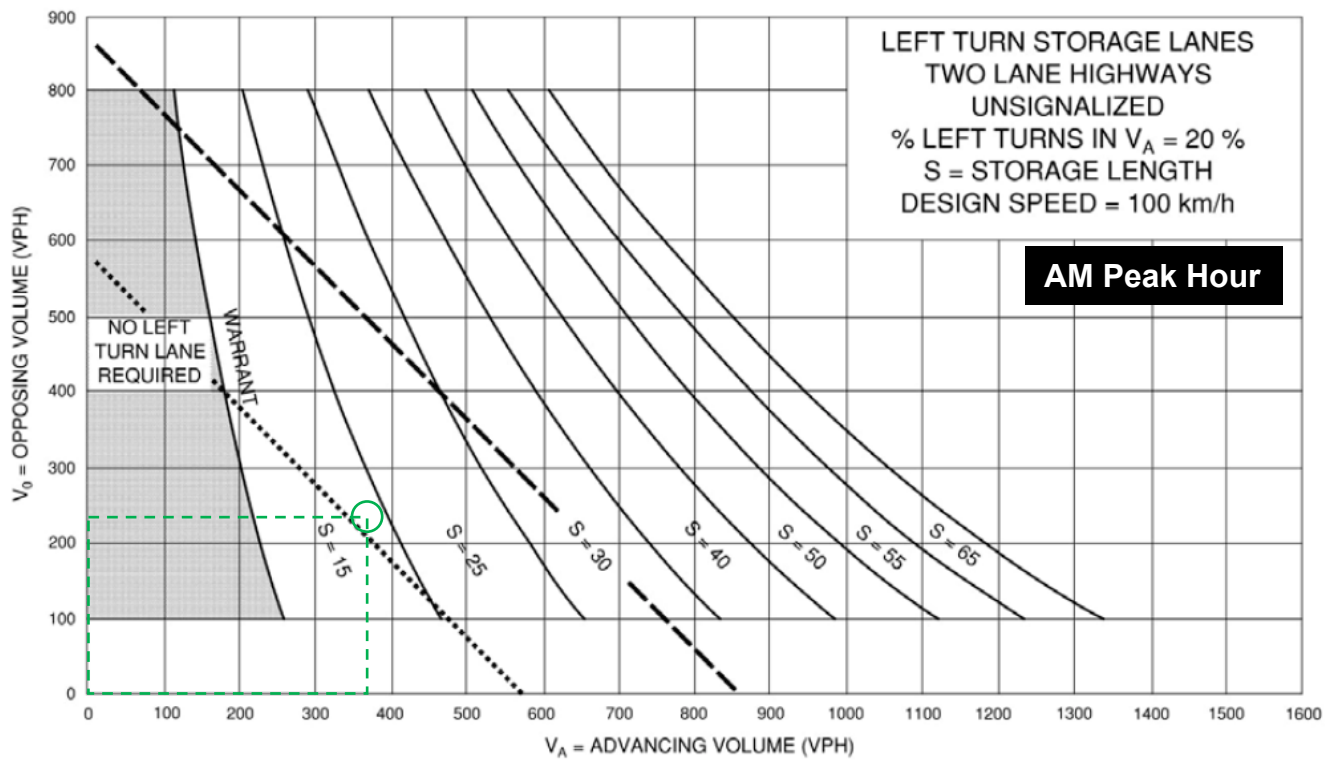
Appendix I

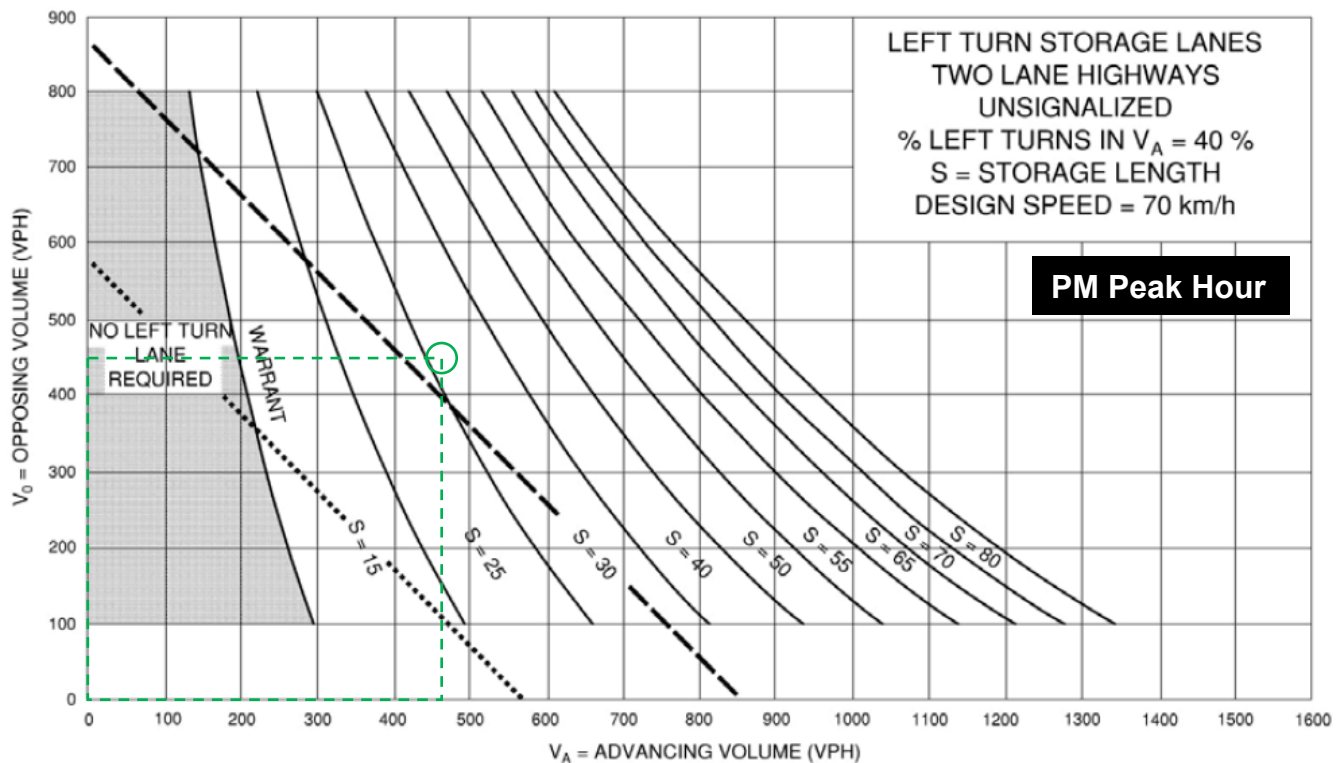
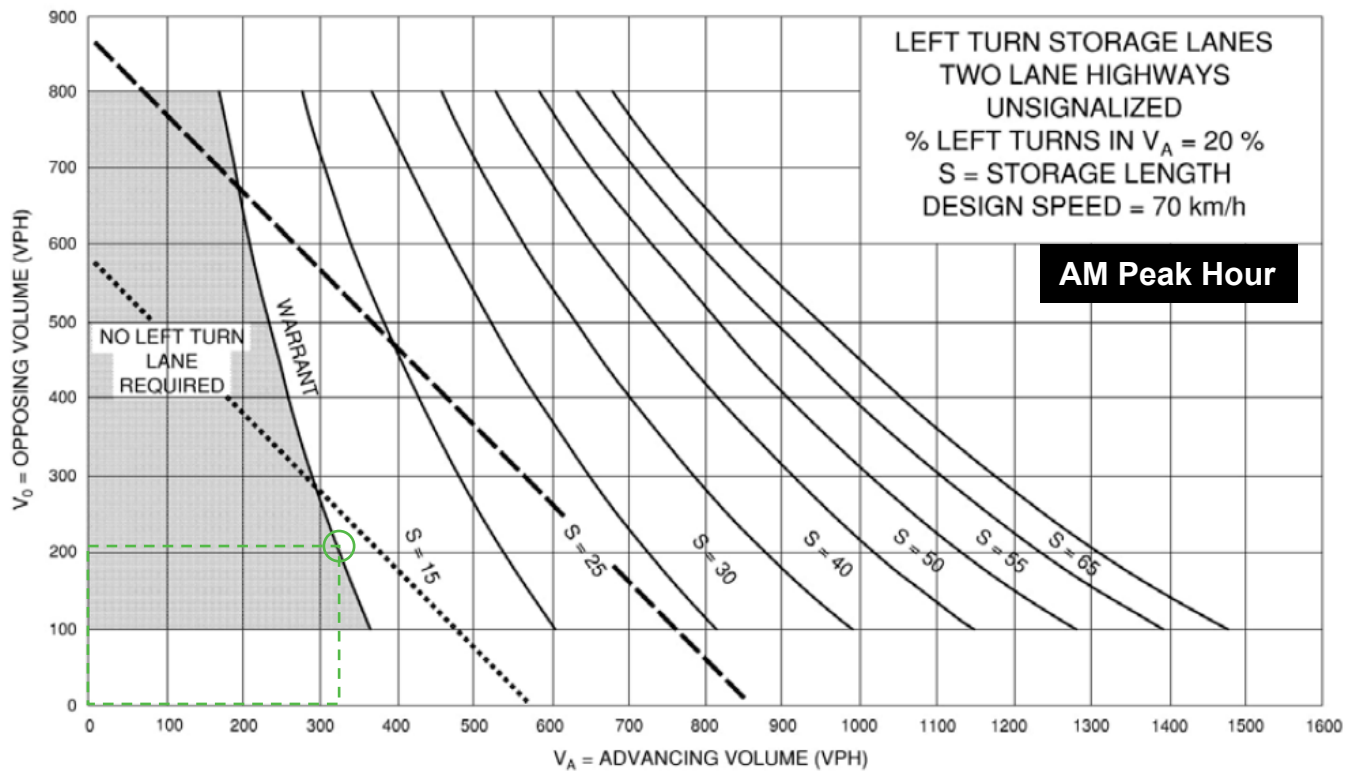
Left-Turn Lane Warrant Nomographs

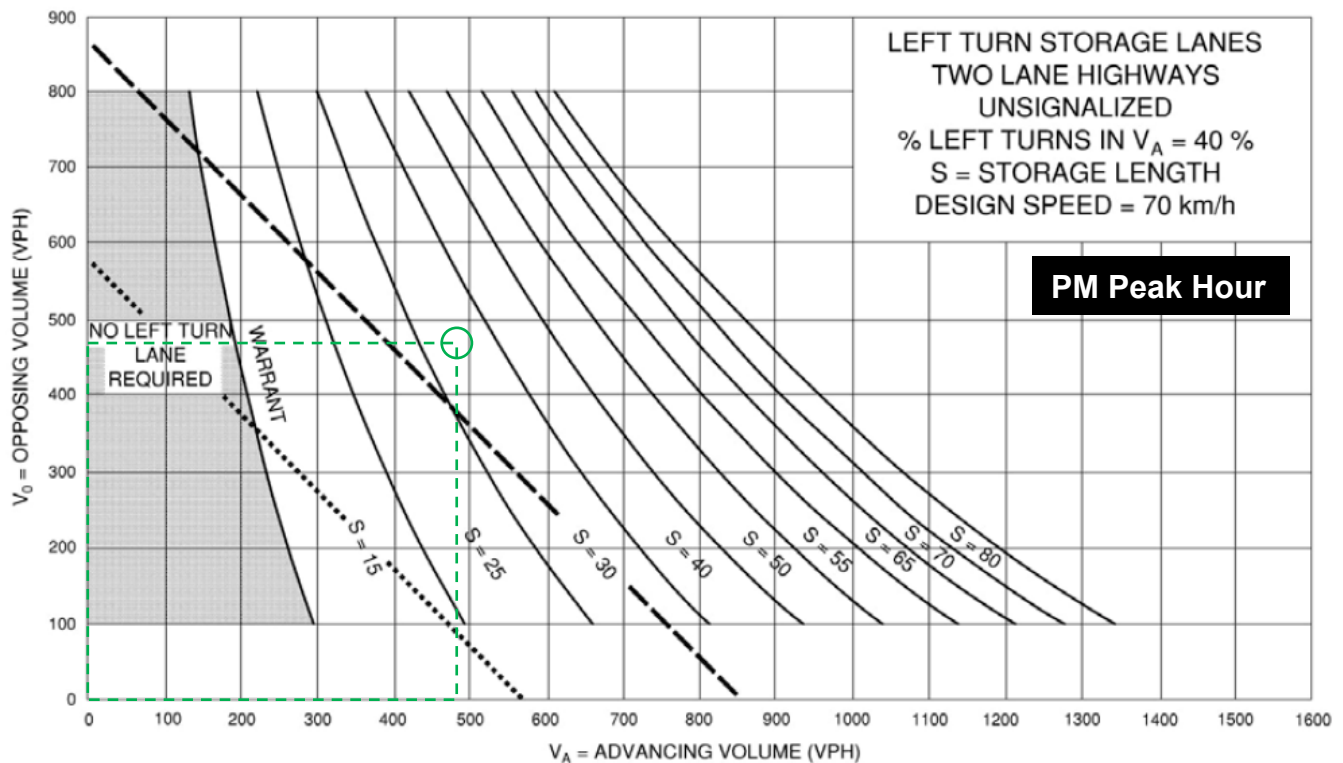
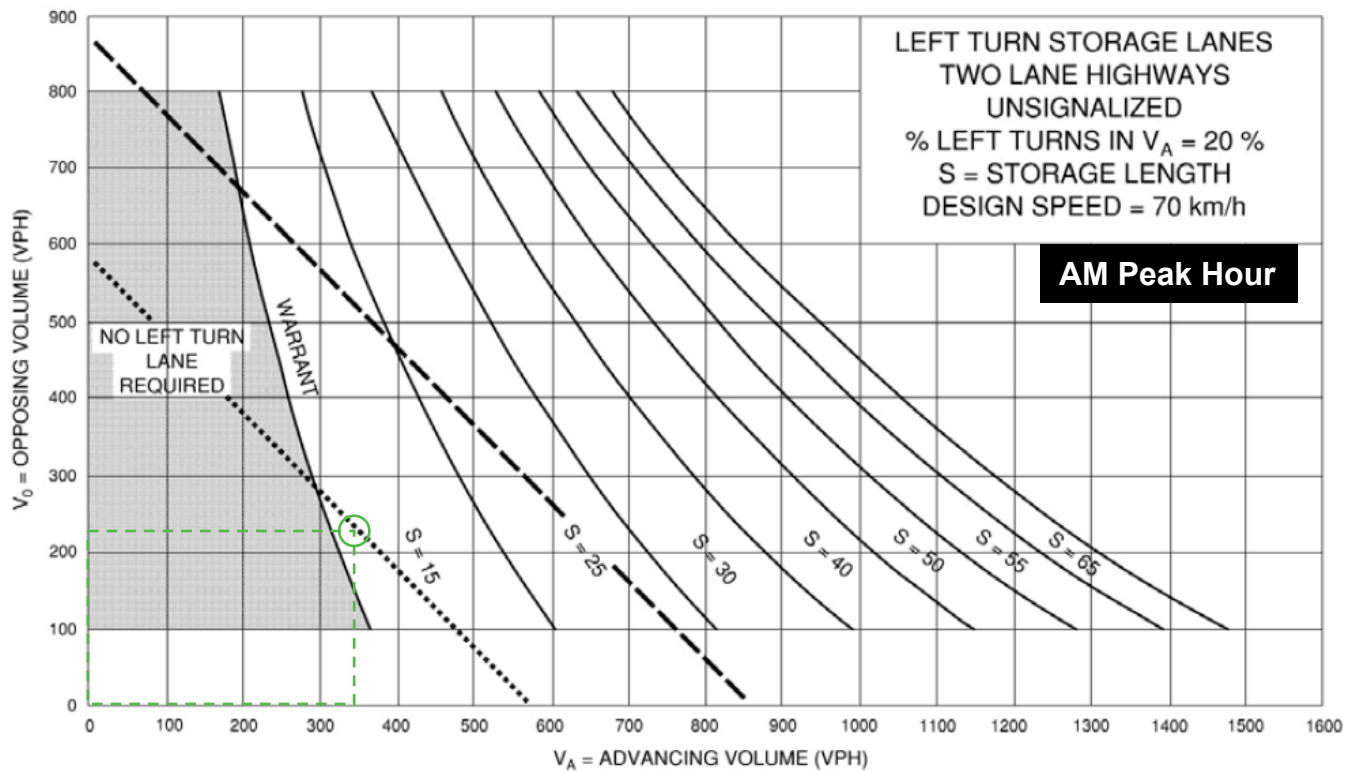


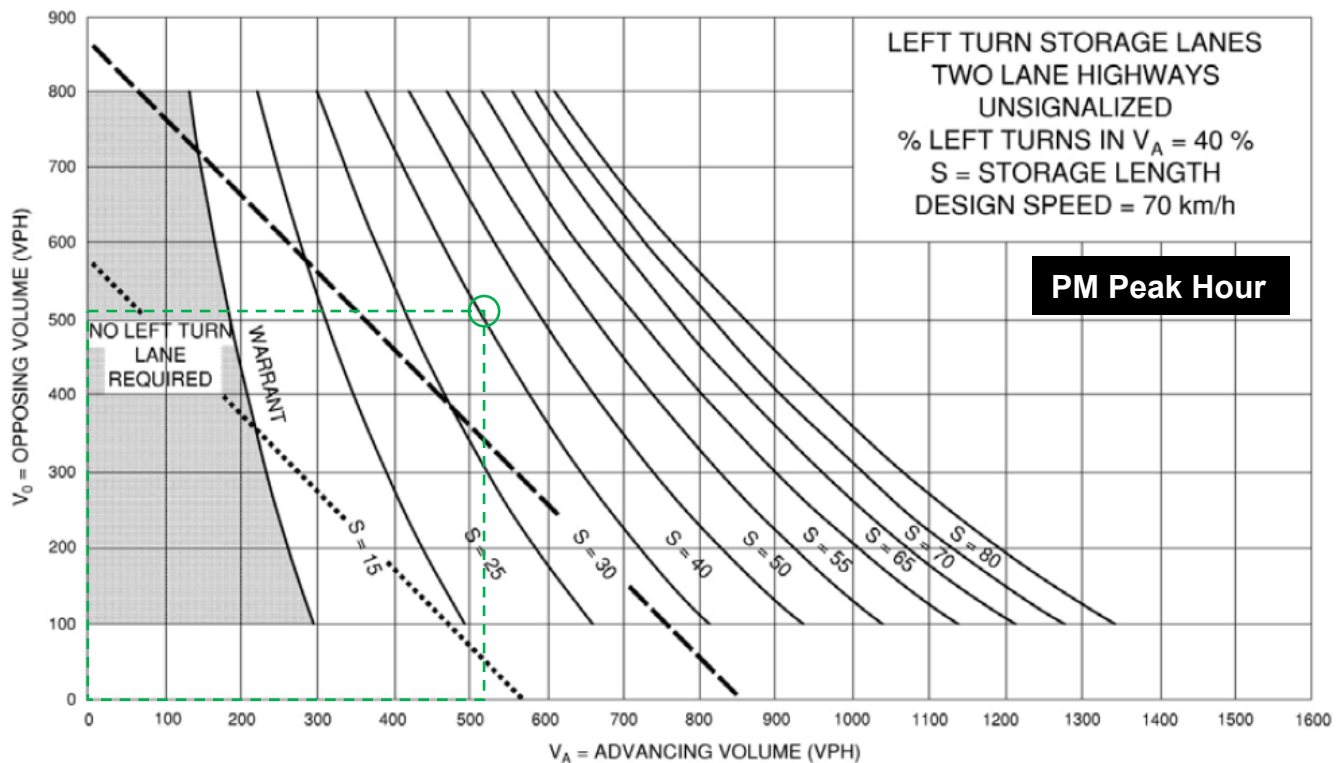
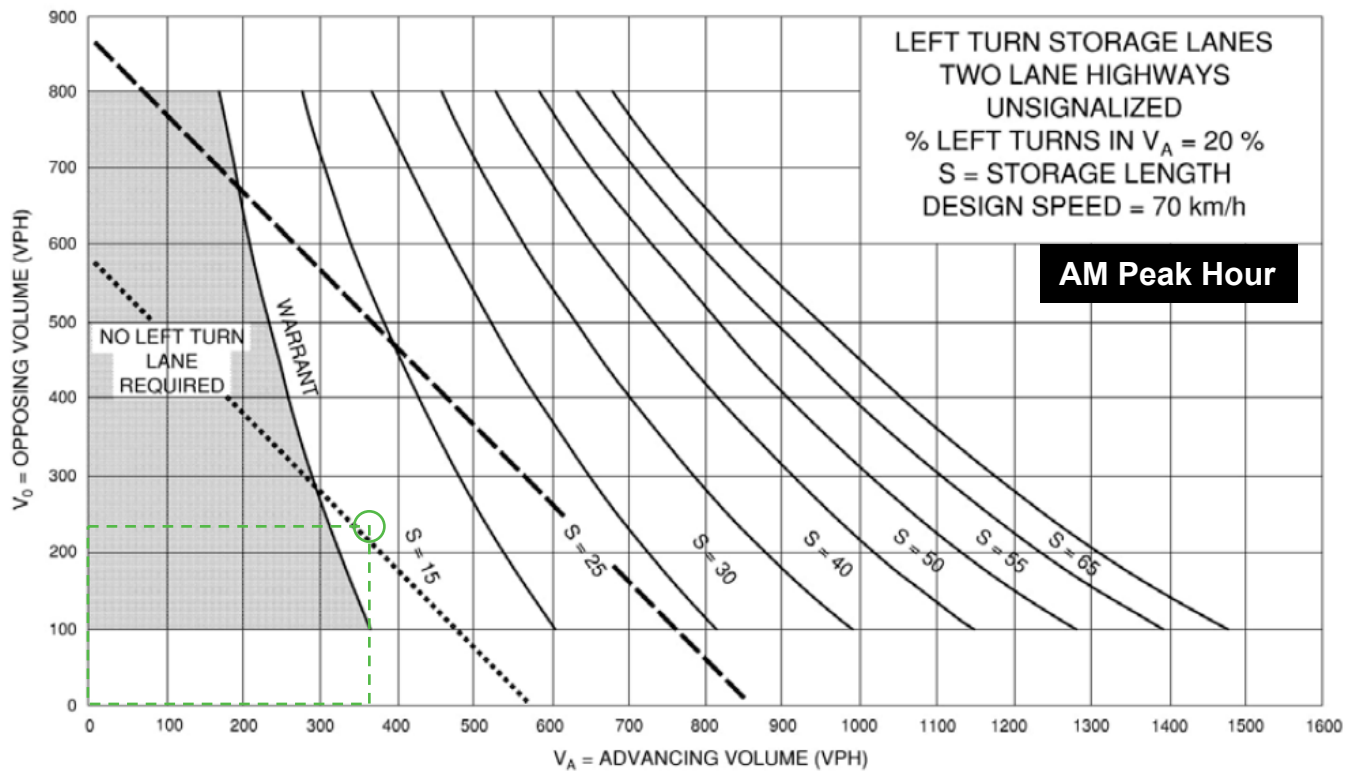


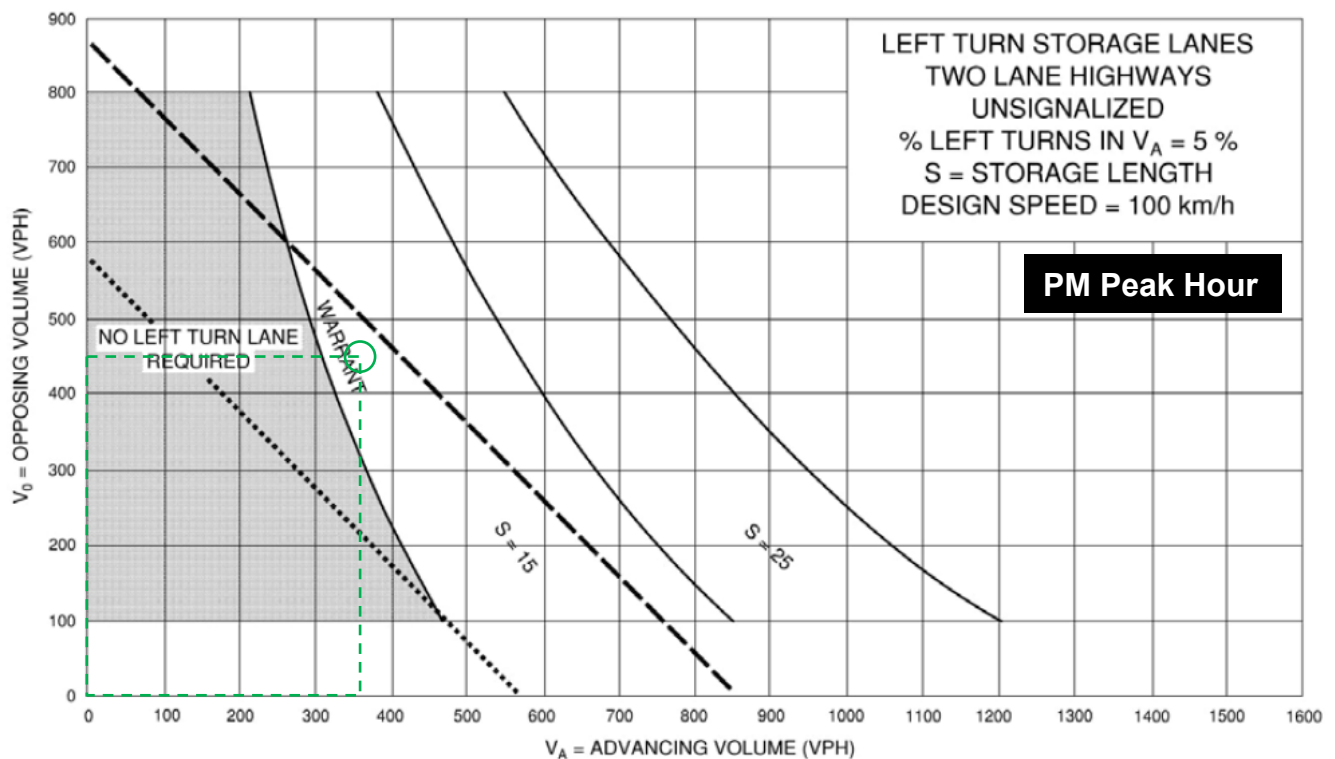
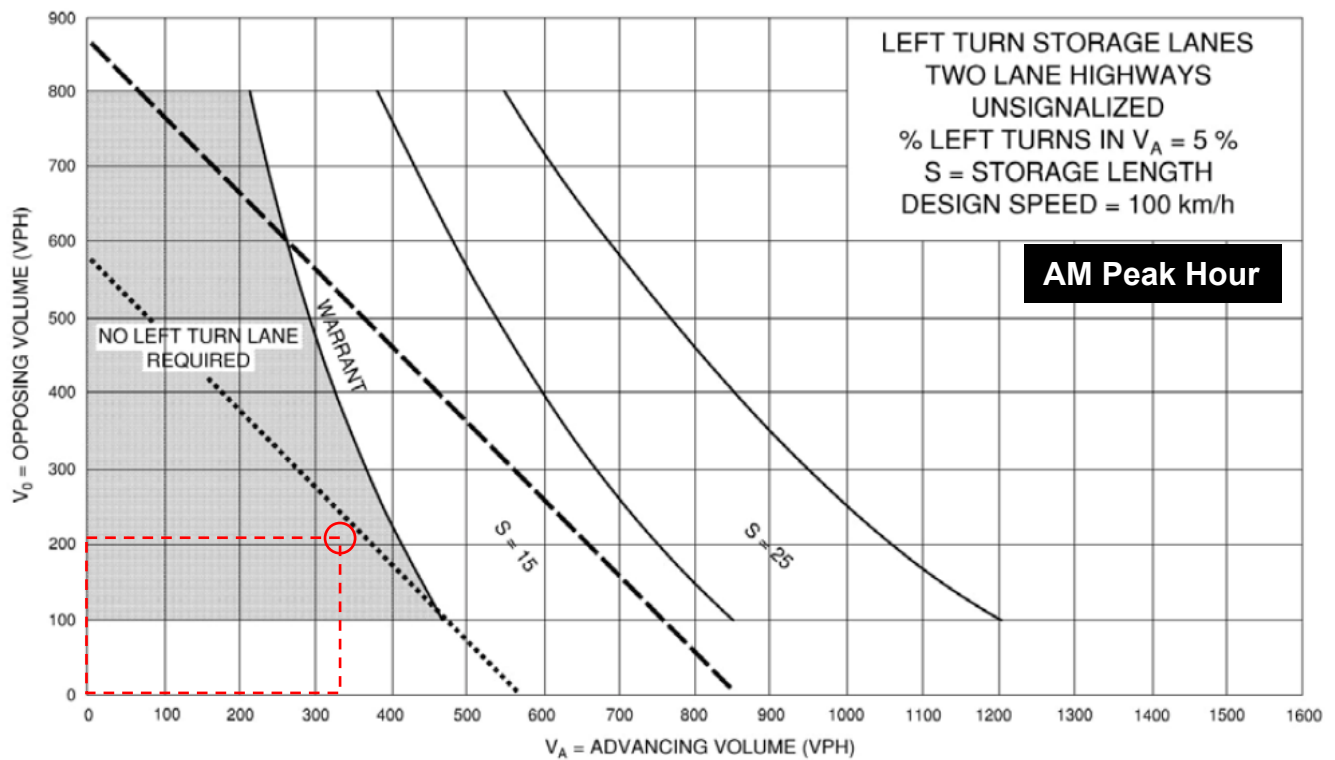


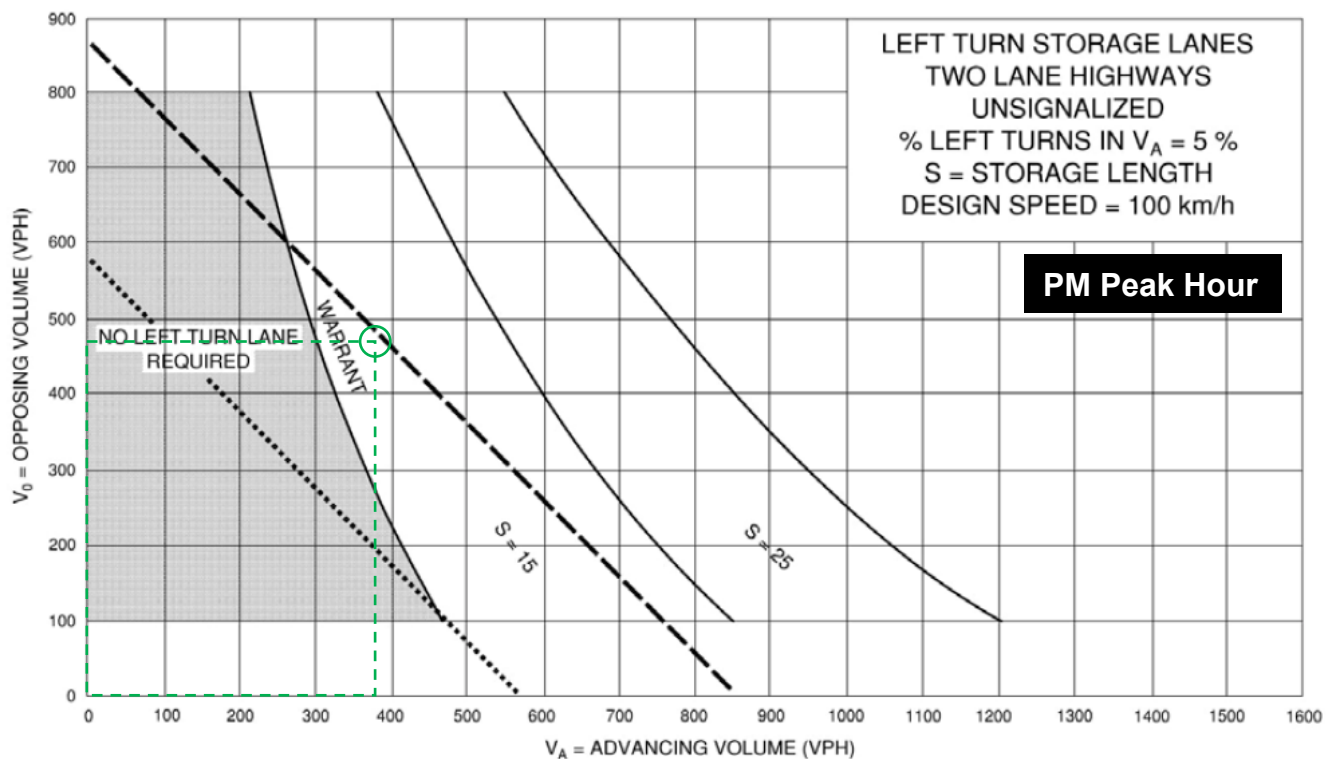
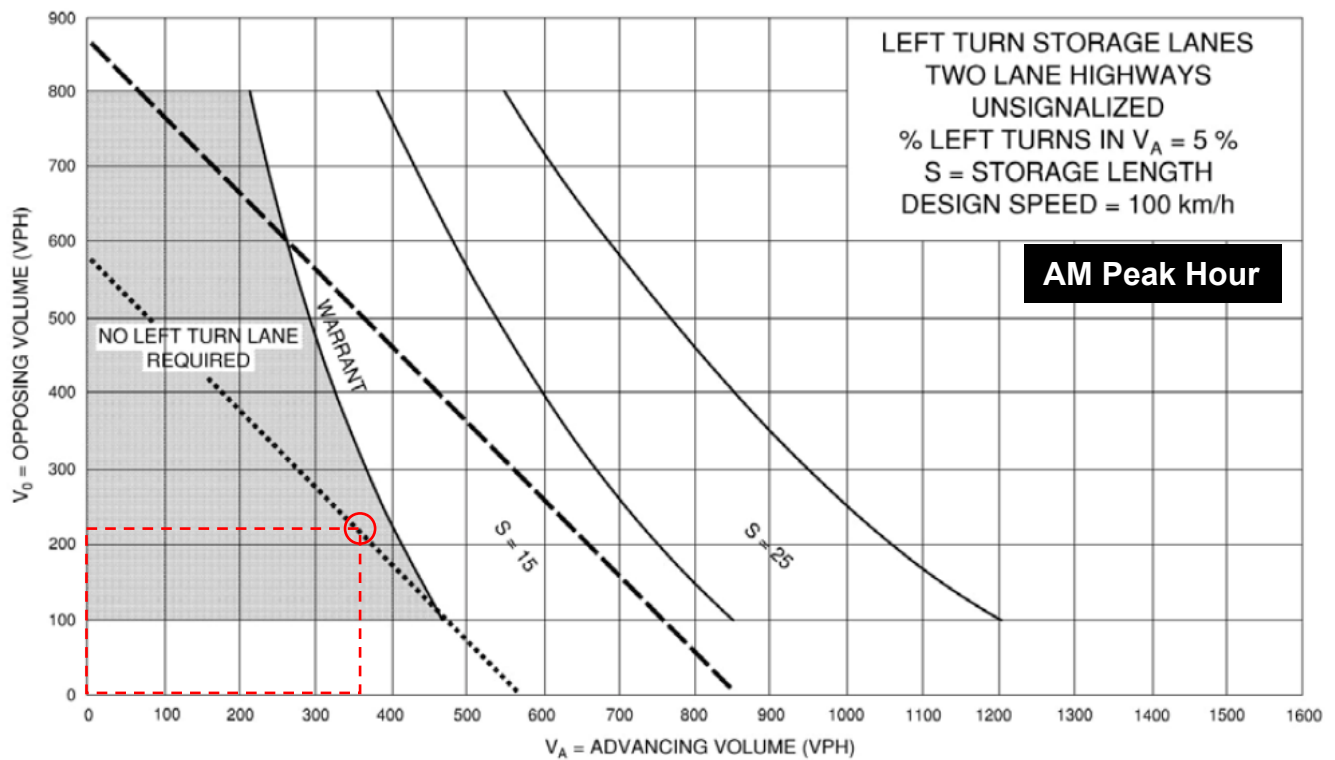


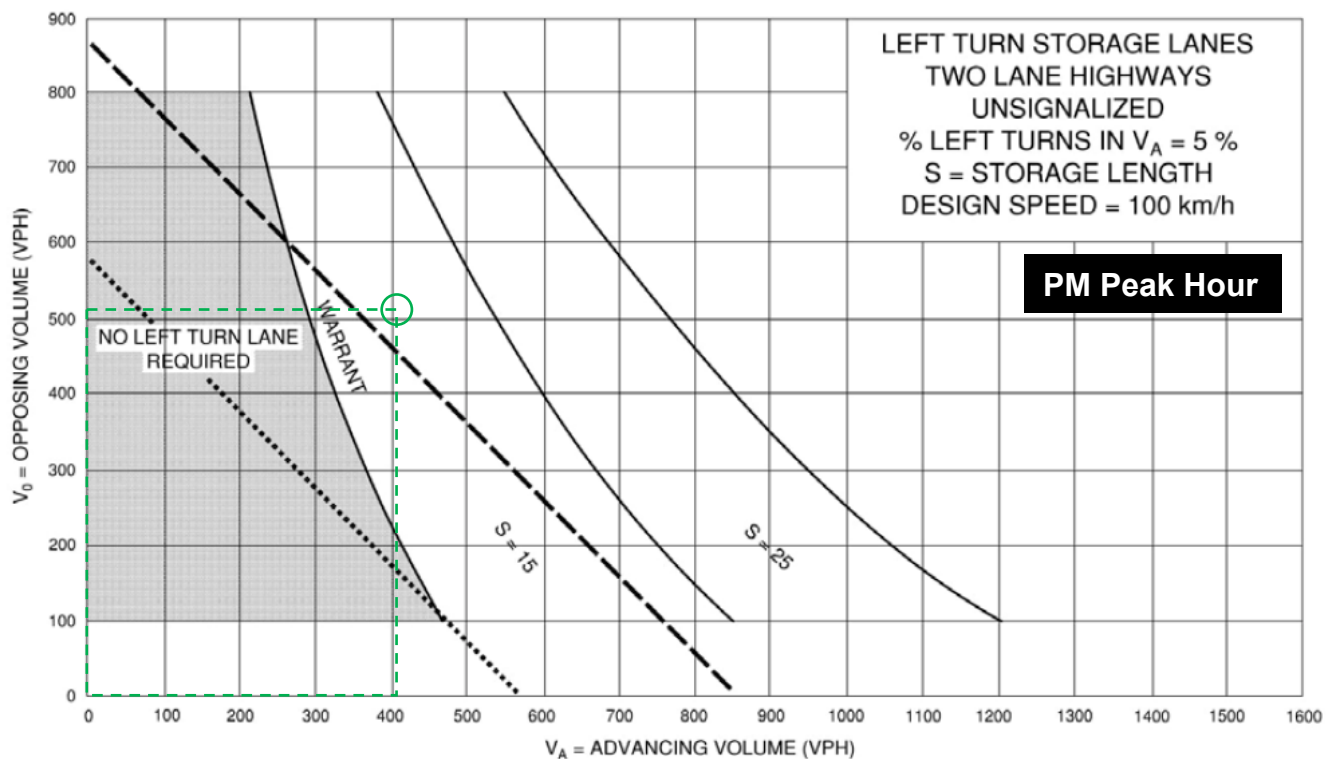
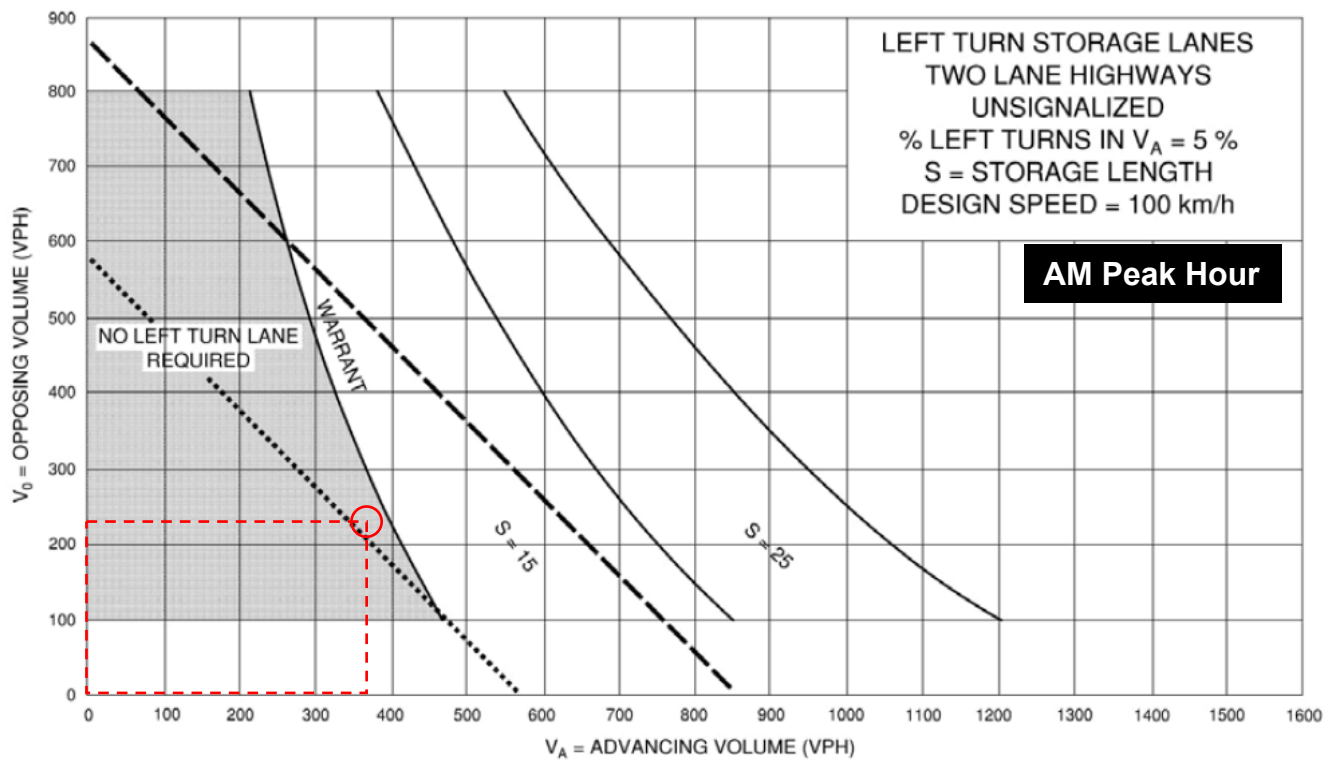


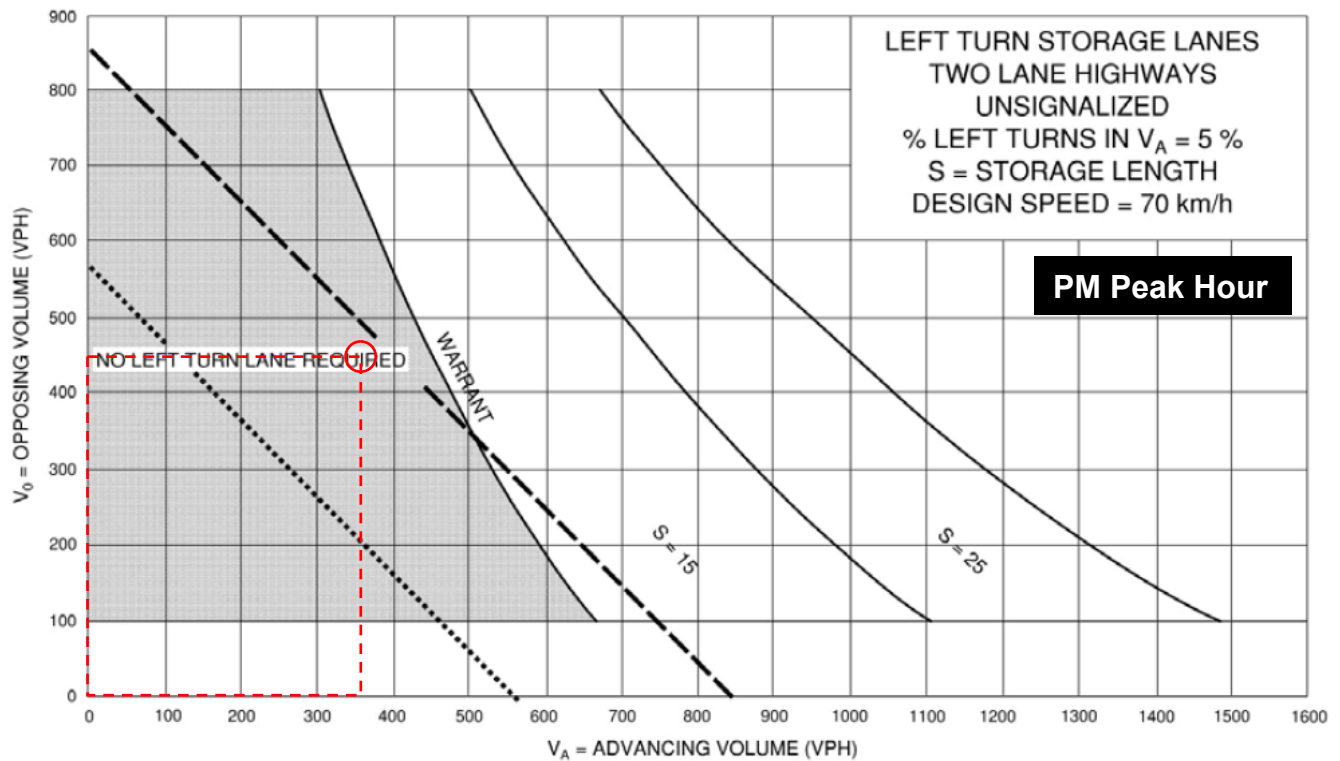
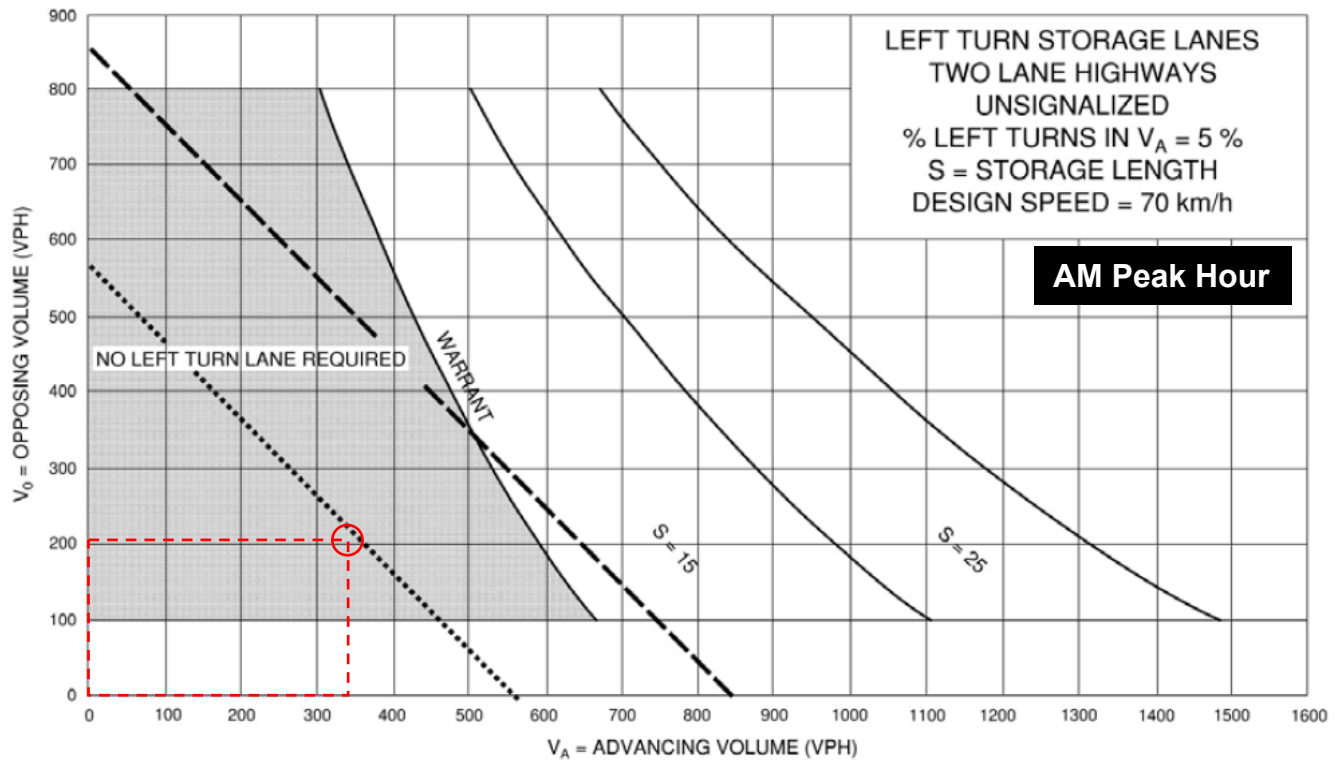


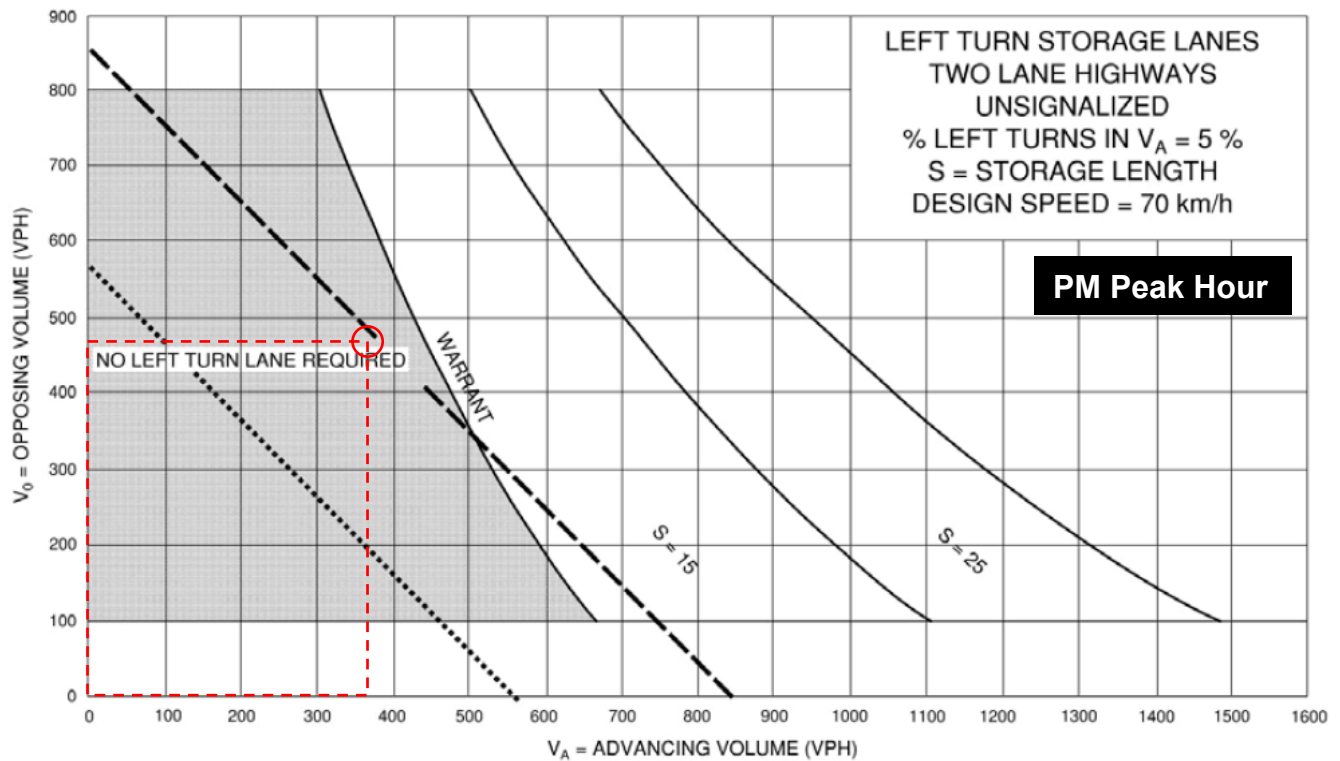
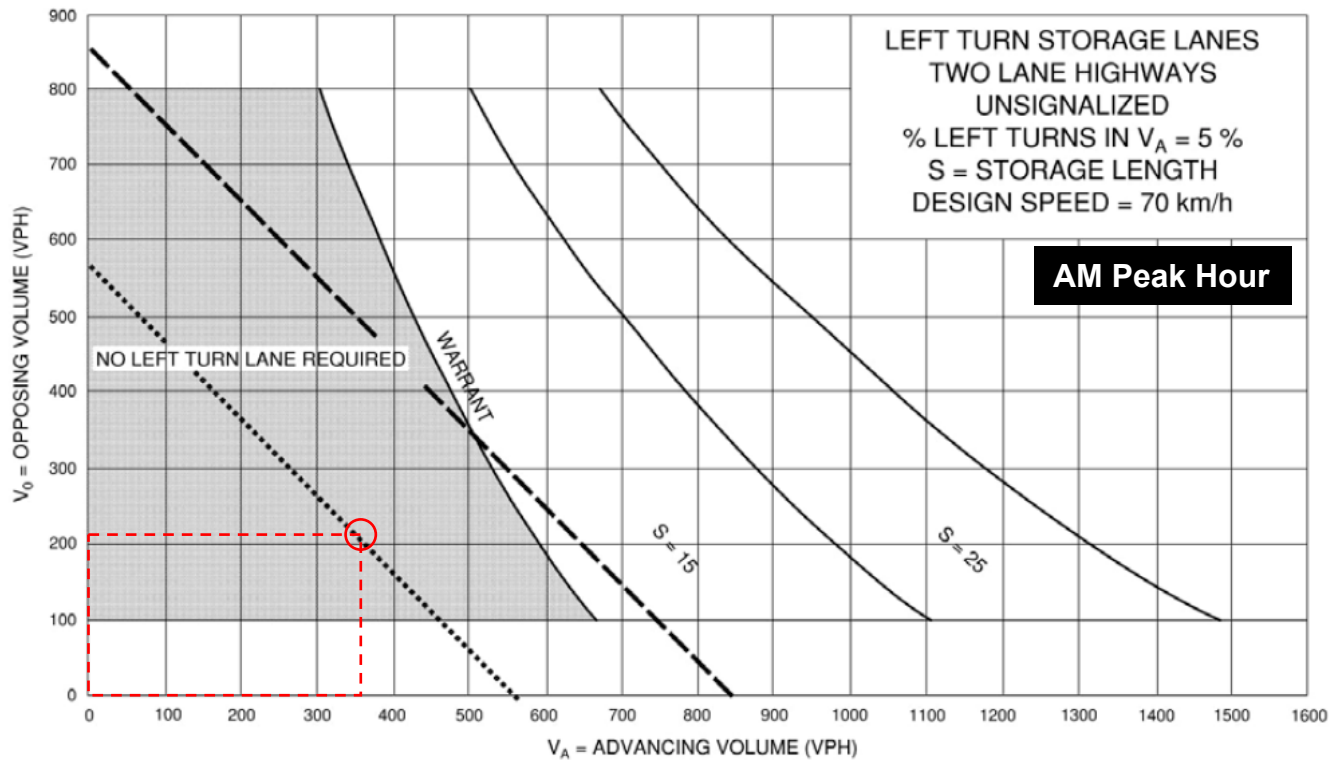


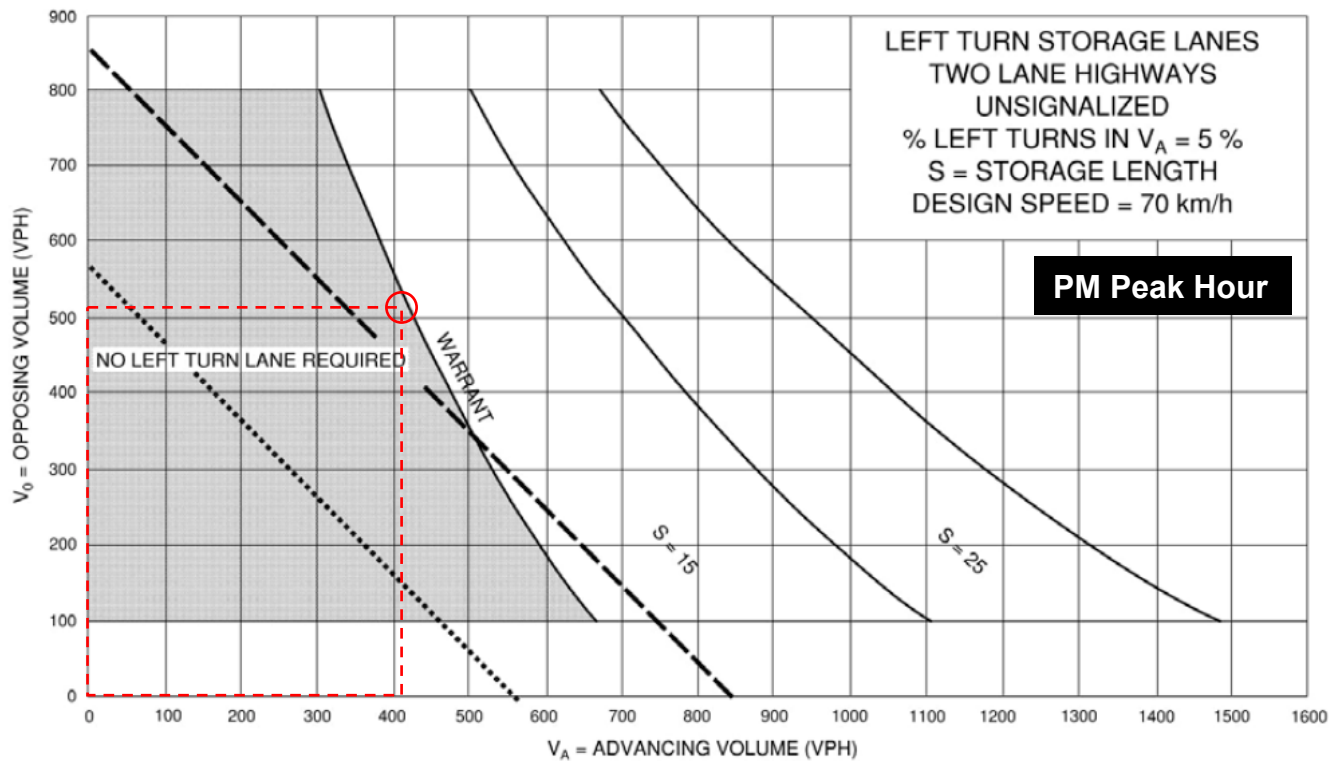
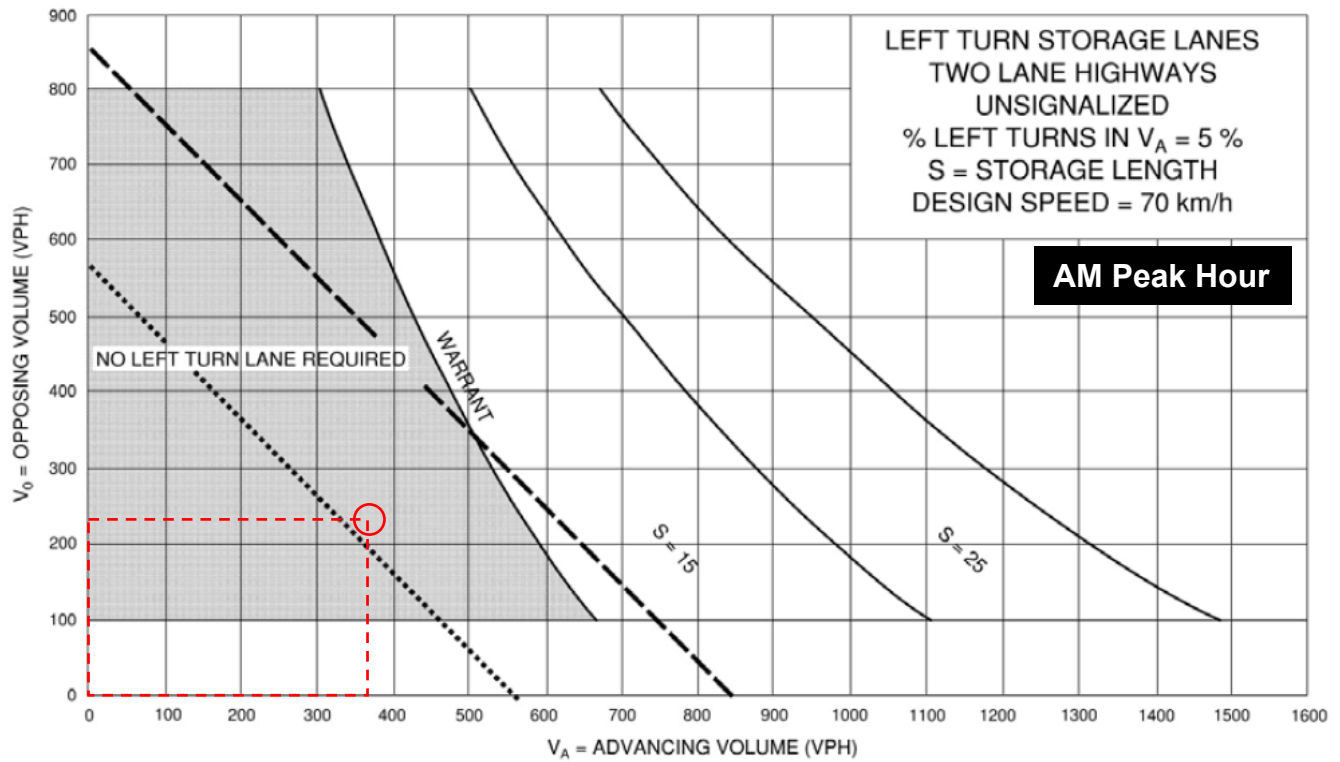


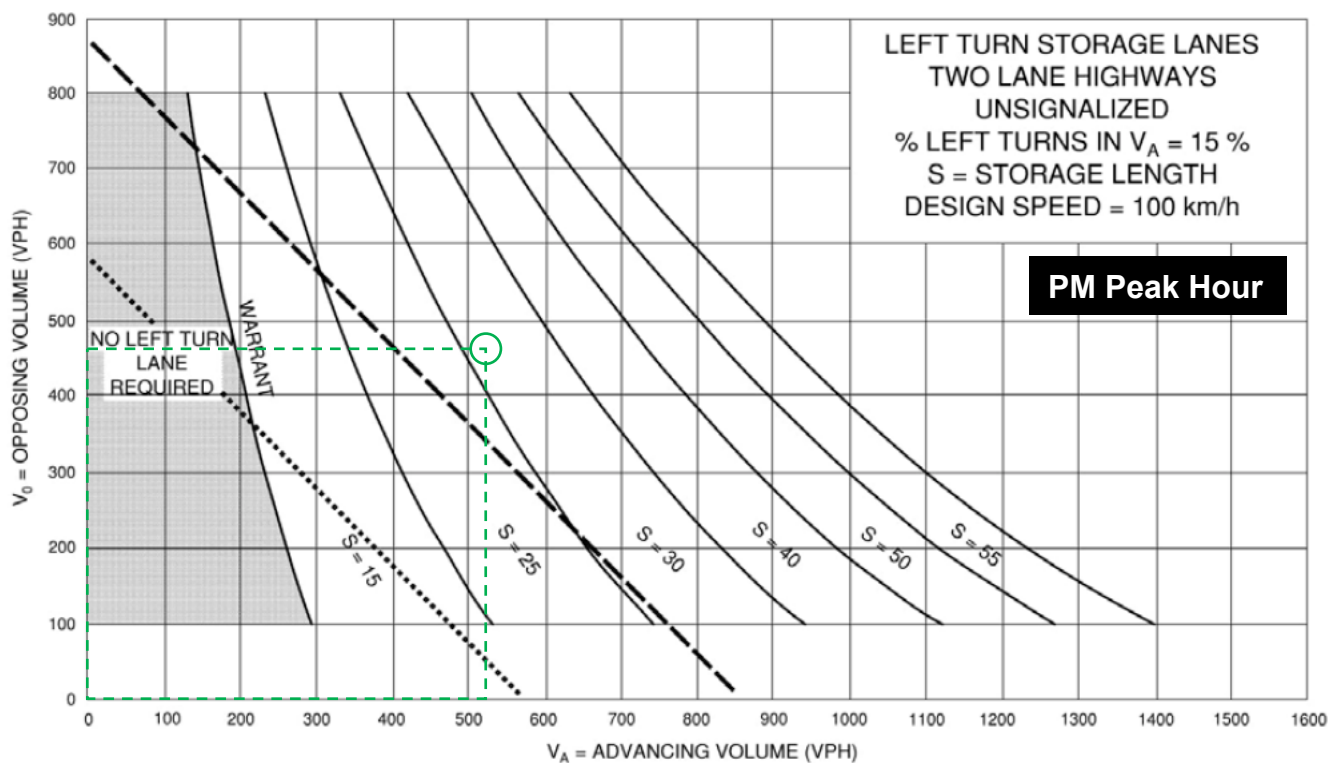
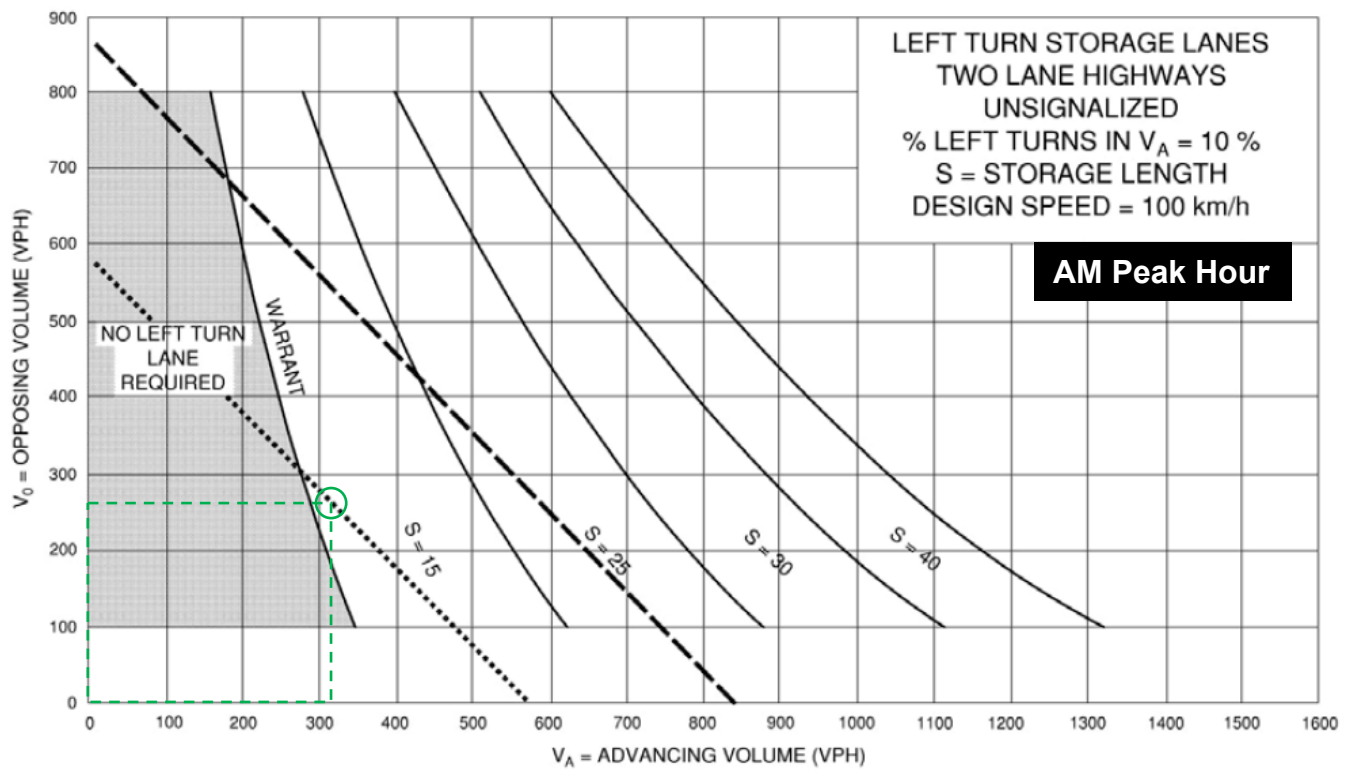


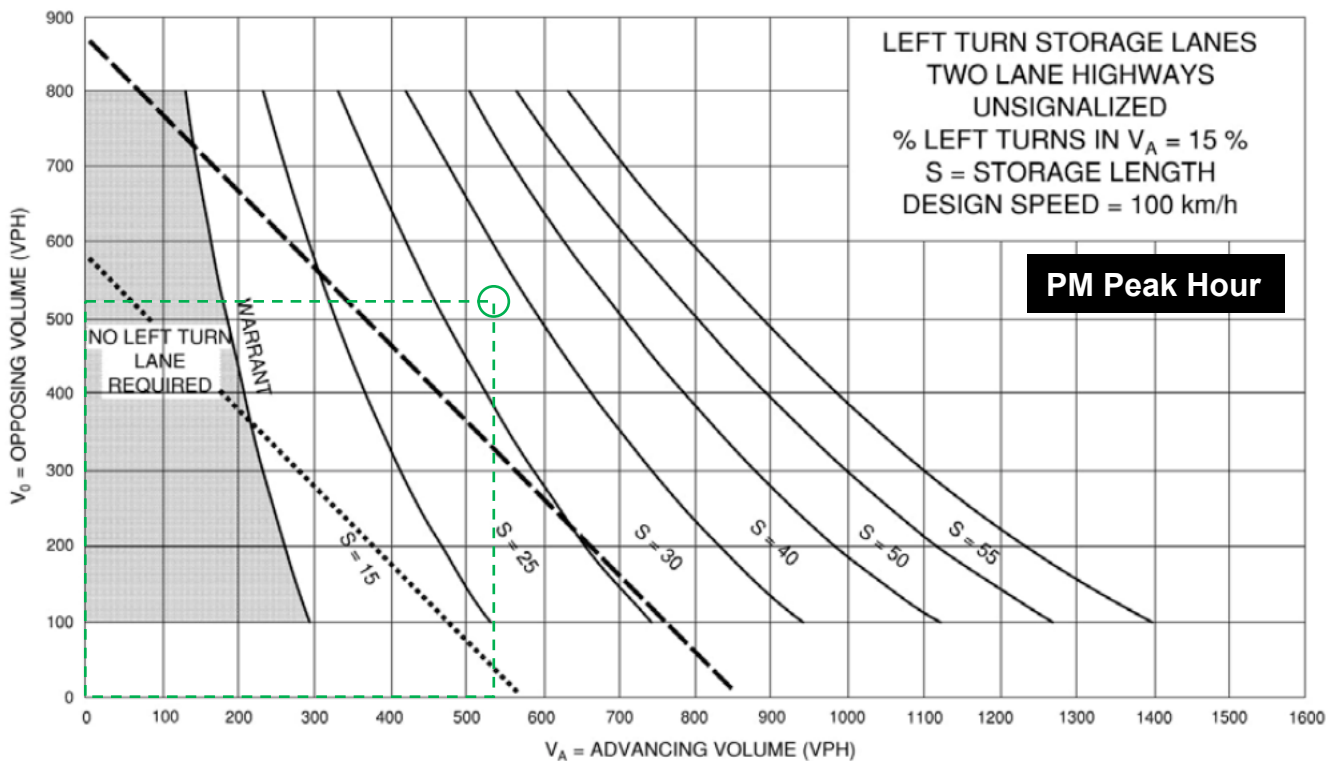
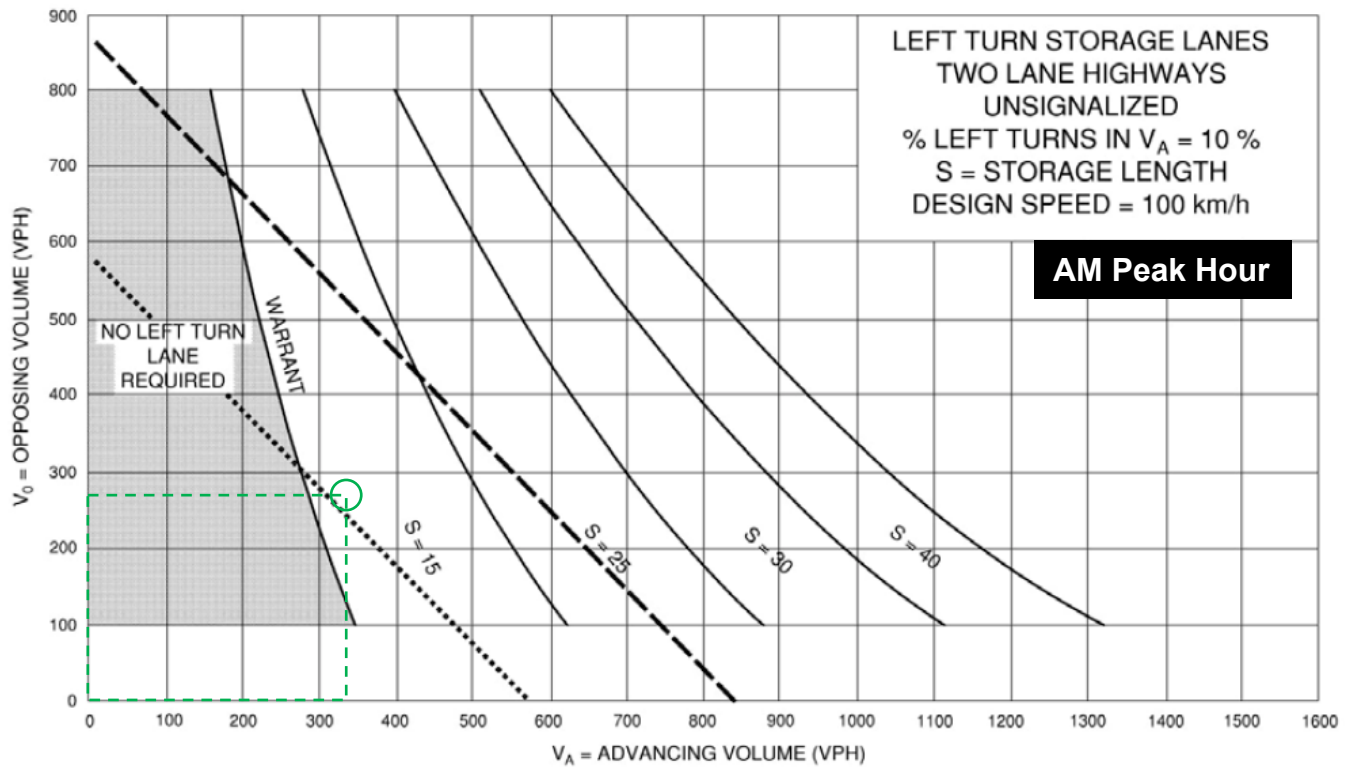


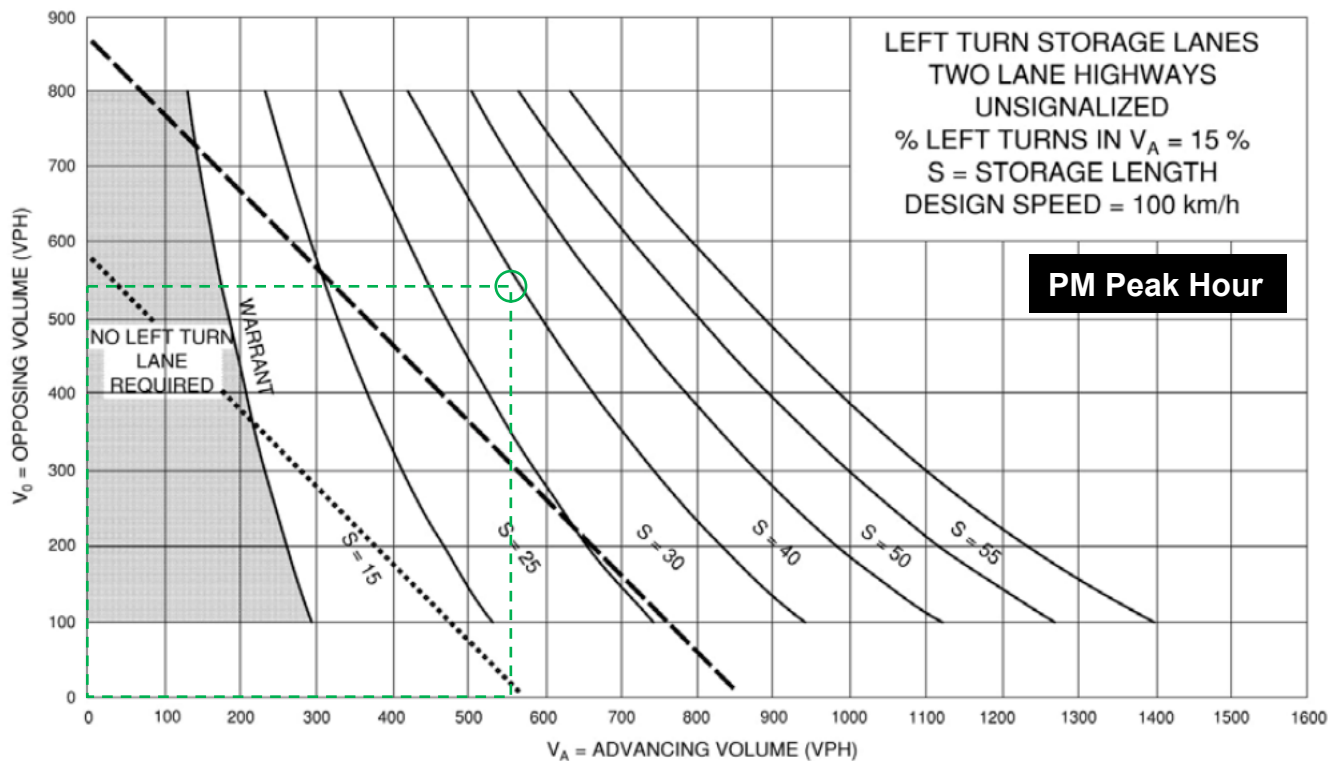
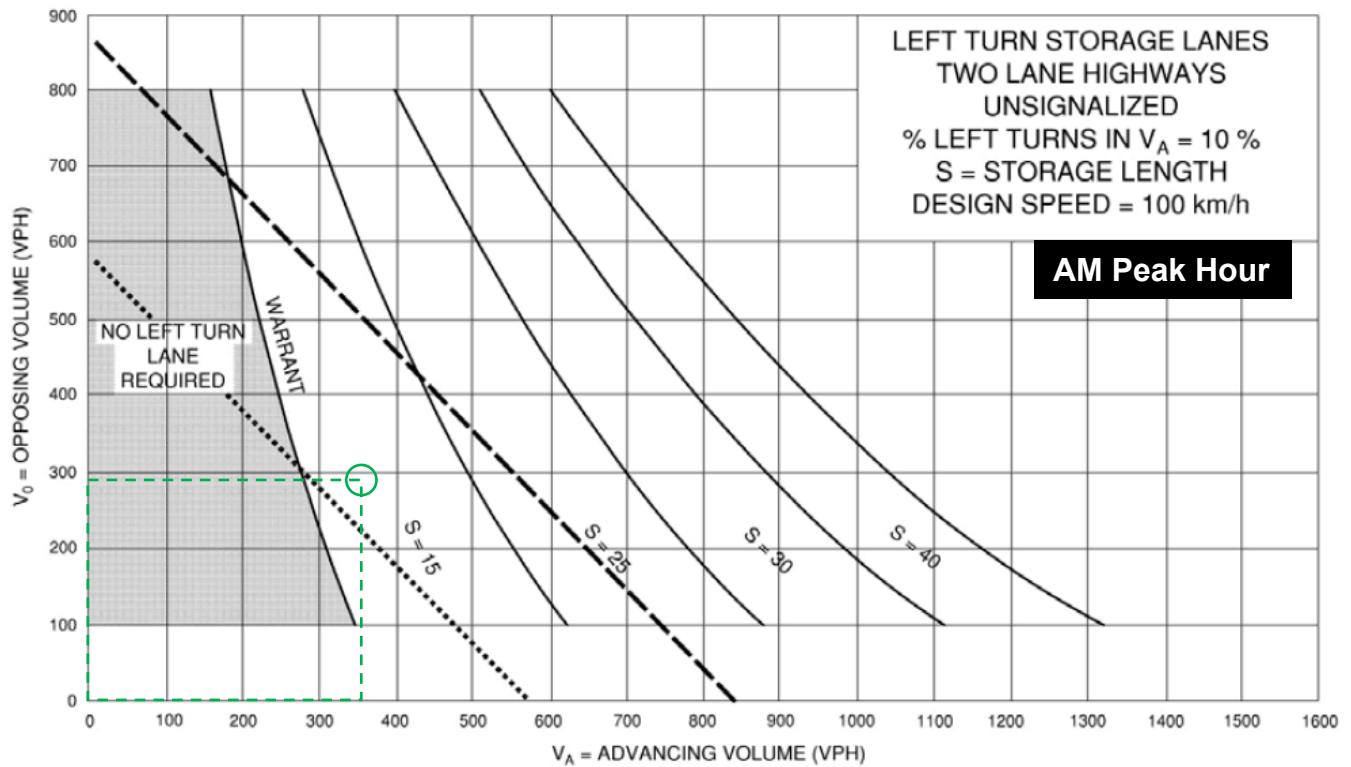


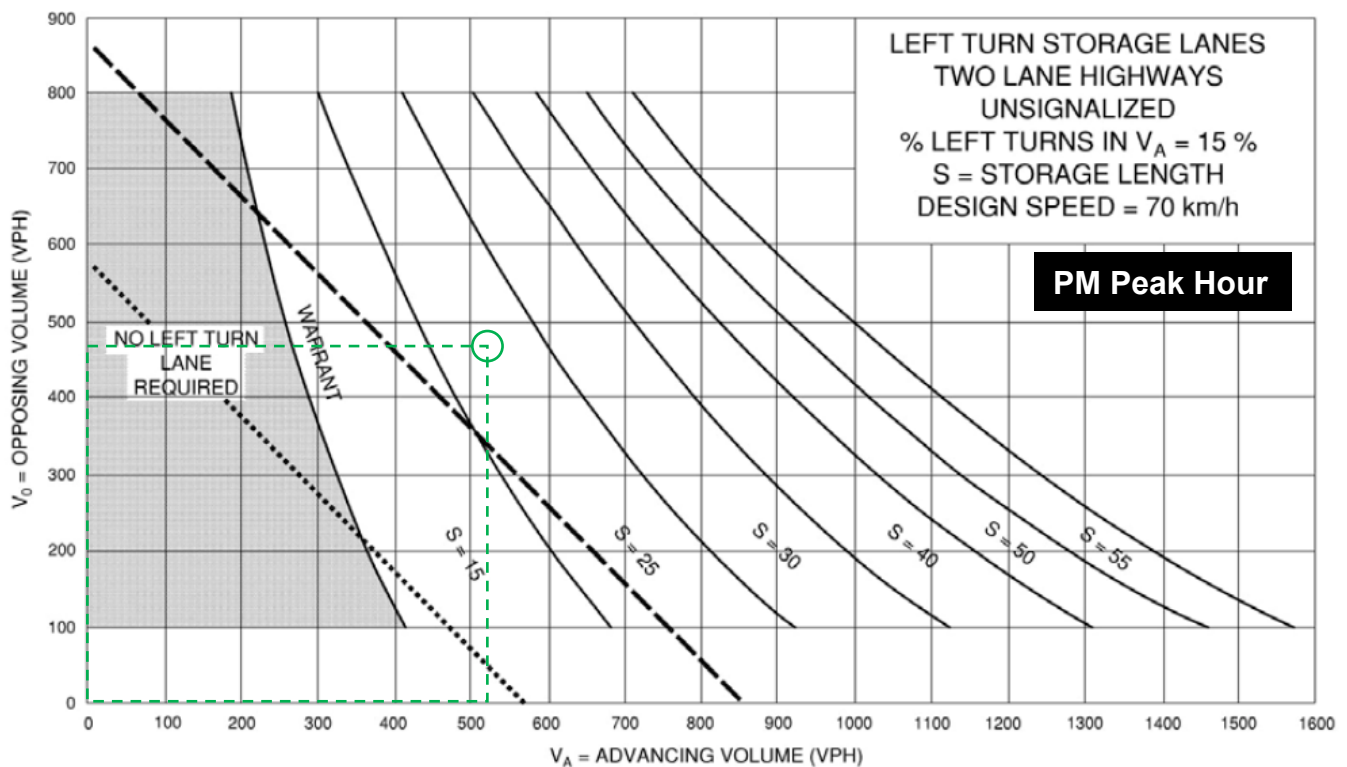
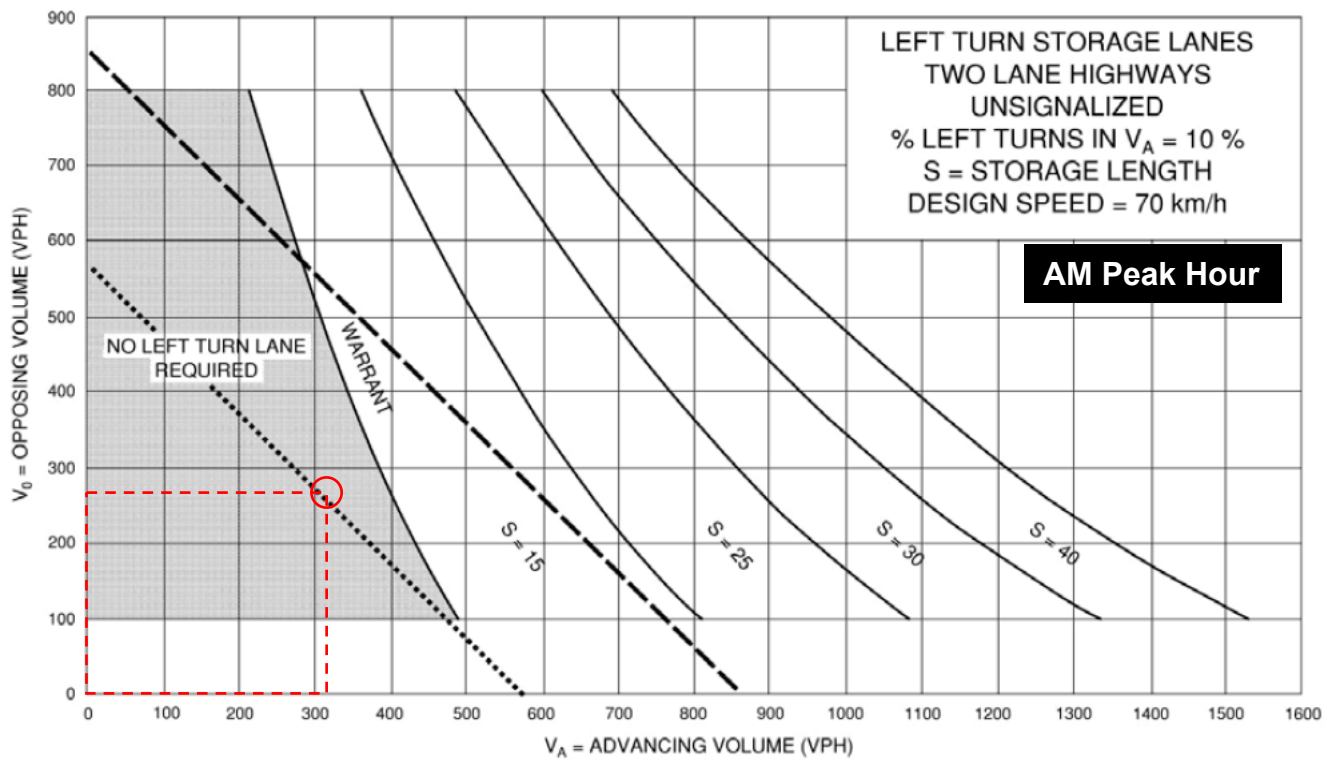


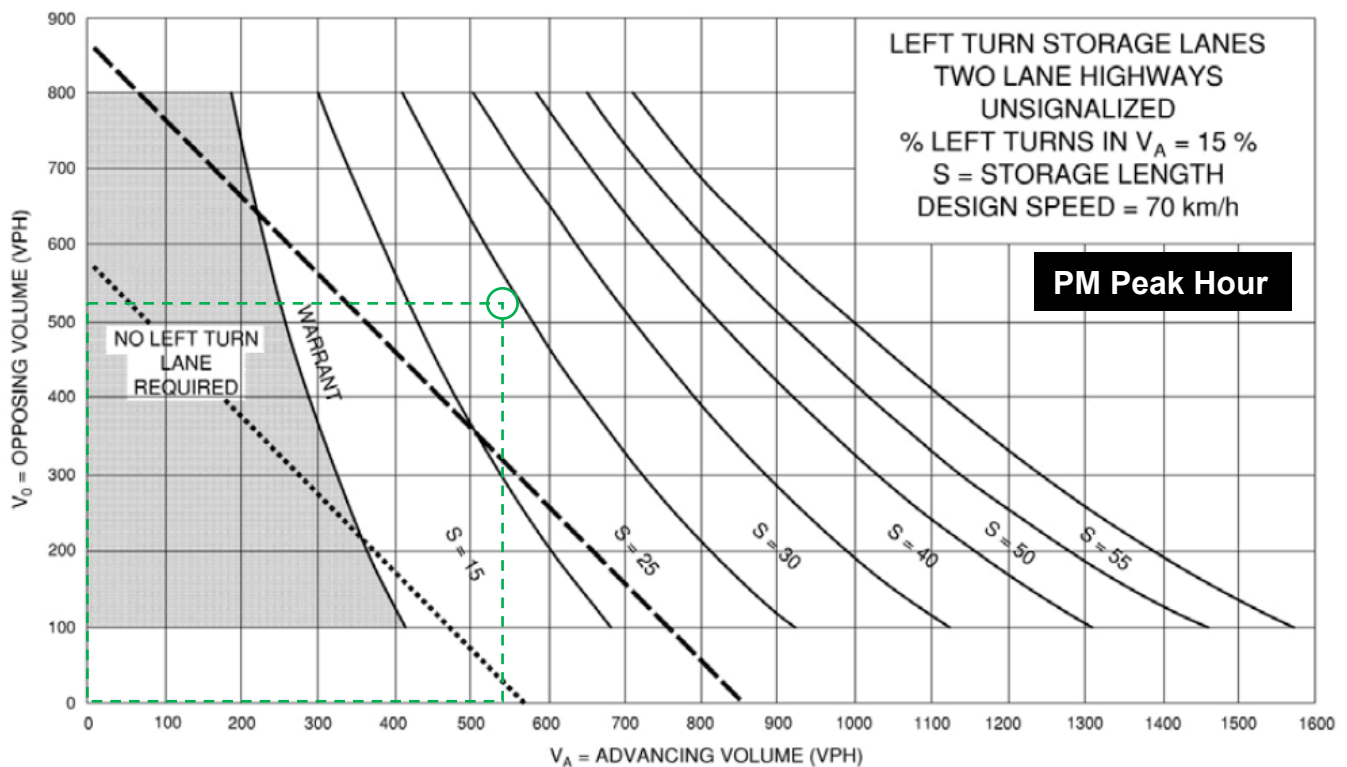
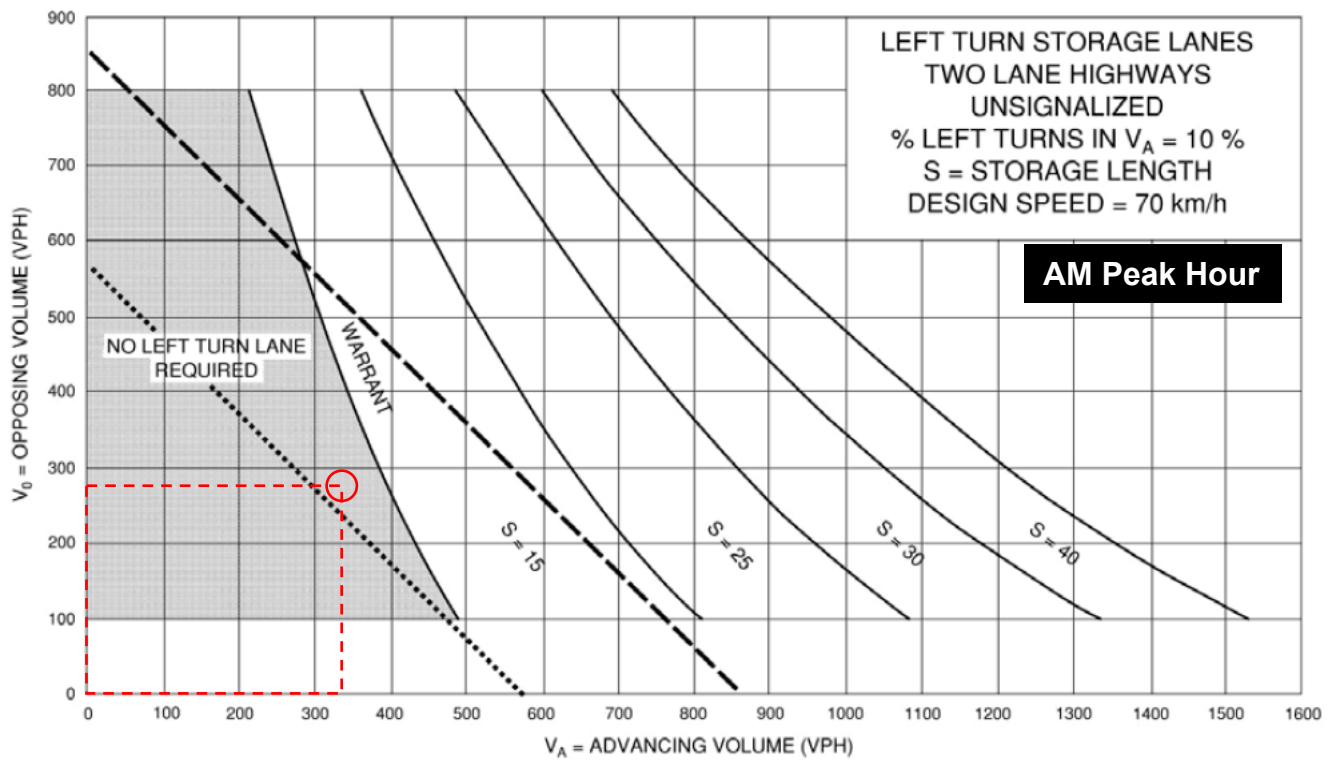


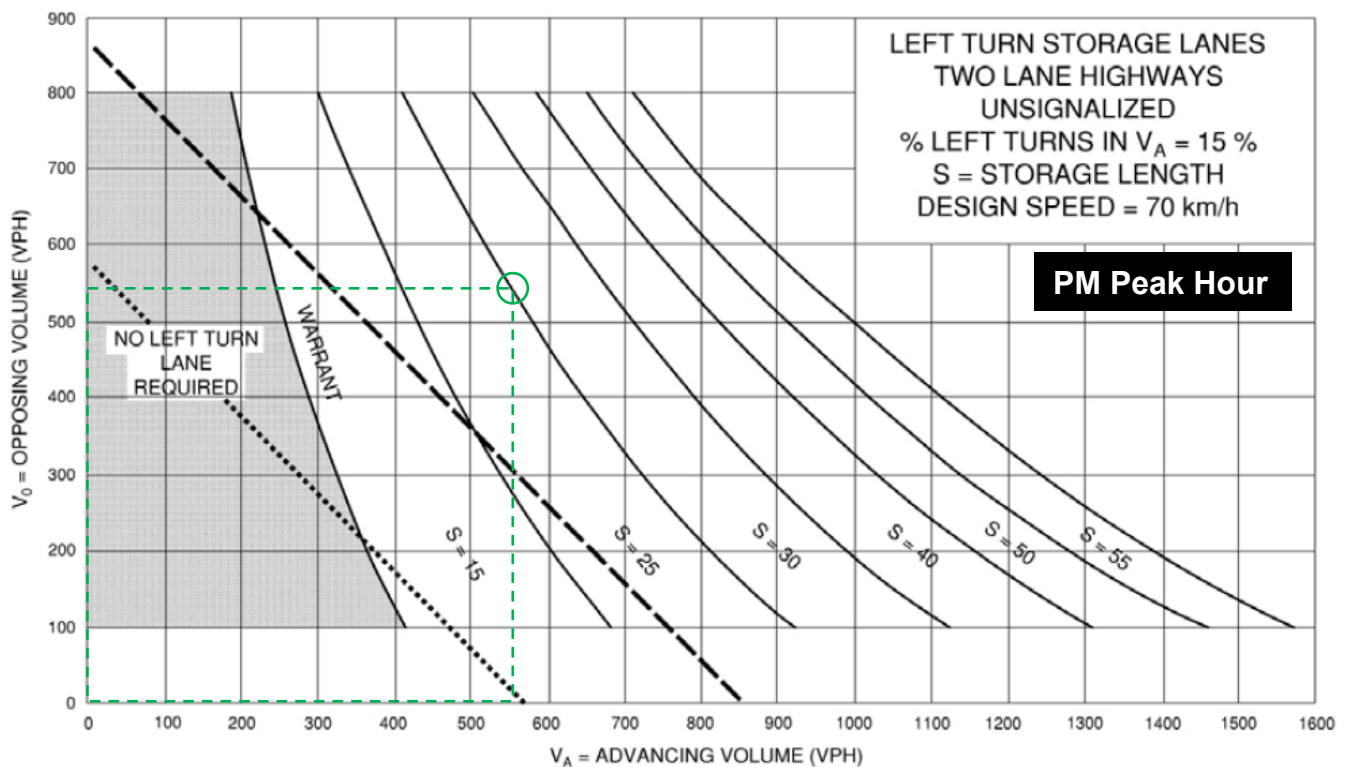
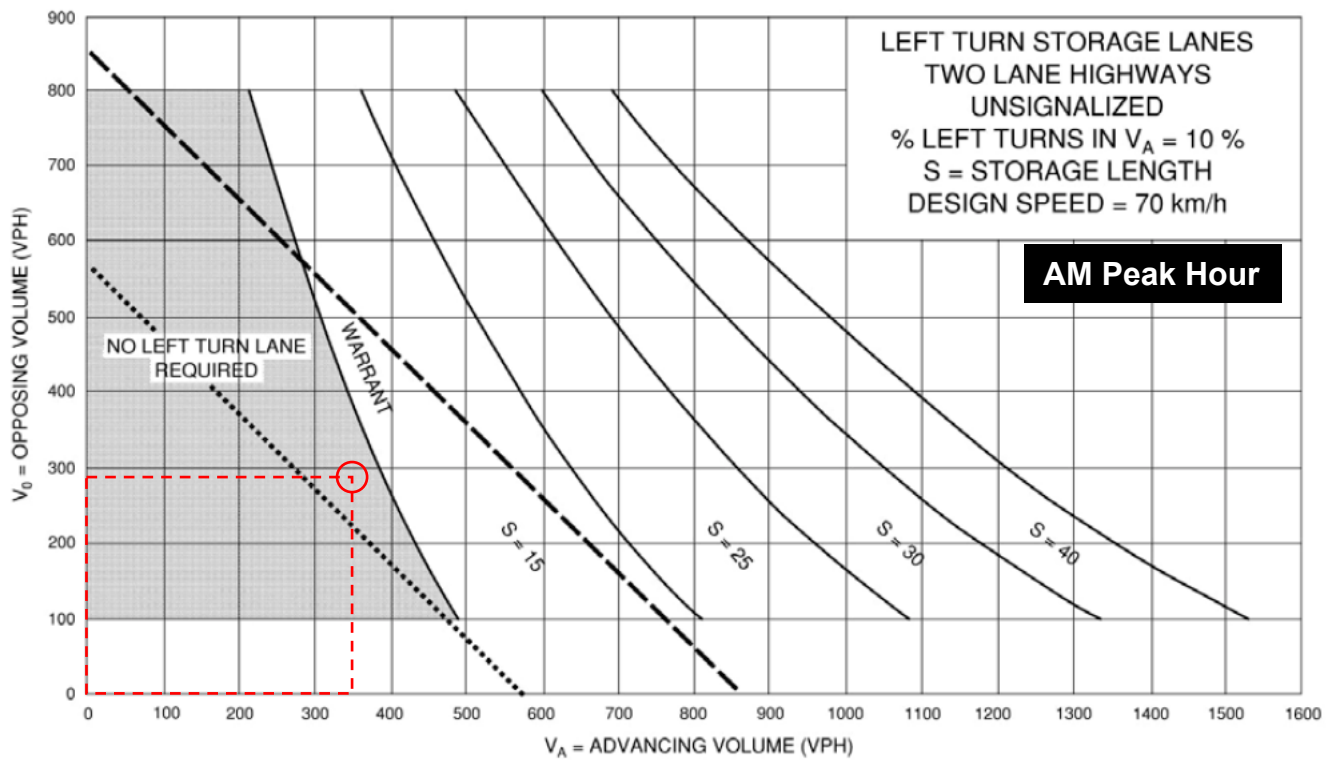












Appendix J

2030 Total Operations with Improvements Synchro Reports



Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰
Traffic Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Future Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0			0.0	50.0		0.0	50.0	0.0
Storage Lanes	1		1	1			0	1		0	1	0
Taper Length (m)	100.0			80.0				50.0			50.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.98	1.00								
Frt			0.850		0.972			0.968			0.975	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1387	2976	973	1287	2441	0	1171	1179	0	836	1152	0
Flt Permitted	0.408			0.347			0.580			0.604		
Satd. Flow (perm)	596	2976	952	470	2441	0	715	1179	0	531	1152	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105		39			21			16	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			229.0	
Travel Time (s)		67.4			41.9			56.4			16.5	
Confl. Peds. (#/hr)			1	1								
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 (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Adj. Flow (vph)	68	628	143	45	429	100	107	172	47	177	201	41
Shared Lane Traffic (%)												
Lane Group Flow (vph)	68	628	143	45	529	0	107	219	0	177	242	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	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	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	
Detector 1 Queue (s)	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	
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	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8						6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	42.0	42.0	42.0	42.0	42.0		48.0	48.0		48.0	48.0	
Total Split (%)	46.7%	46.7%	46.7%	46.7%	46.7%		53.3%	53.3%		53.3%	53.3%	
Maximum Green (s)	35.0	35.0	35.0	35.0	35.0		42.0	42.0		42.0	42.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	26.8	26.8	26.8	26.8	26.8		29.0	29.0		29.0	29.0	
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.42		0.45	0.45		0.45	0.45	
v/c Ratio	0.27	0.51	0.31	0.23	0.51		0.33	0.40		0.74	0.46	
Control Delay	19.9	17.7	8.4	19.9	17.0		14.3	12.7		35.0	14.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.9	17.7	8.4	19.9	17.0		14.3	12.7		35.0	14.1	
LOS	B	B	A	B	B		B	B		D	B	
Approach Delay		16.3			17.2			13.2			22.9	
Approach LOS		B			B			B			C	
Intersection Summary												
Area Type: Other												
Cycle Length: 90												
Actuated Cycle Length: 64.2												
Natural Cycle: 85												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.74												
Intersection Signal Delay: 17.4												
Intersection Capacity Utilization 75.3%												
ICU Level of Service D												
Analysis Period (min) 15												
Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane												

Thorold Townline & Highway 20, Thorold
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Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	68	628	143	45	529	107	219	177	242
v/c Ratio	0.27	0.51	0.31	0.23	0.51	0.33	0.40	0.74	0.46
Control Delay	19.9	17.7	8.4	19.9	17.0	14.3	12.7	35.0	14.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	17.7	8.4	19.9	17.0	14.3	12.7	35.0	14.1
Queue Length 50th (m)	5.3	29.0	2.8	3.5	22.4	7.0	13.2	14.8	15.6
Queue Length 95th (m)	18.7	59.5	17.1	13.8	49.2	21.3	35.0	#54.7	40.6
Internal Link Dist (m)		912.7			557.5		759.0		205.0
Turn Bay Length (m)	90.0		20.0	55.0		50.0		50.0	
Base Capacity (vph)	372	1858	633	293	1539	517	858	384	837
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.23	0.15	0.34	0.21	0.26	0.46	0.29

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

AM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰	↰
Traffic Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Future Volume (vph)	63	578	132	41	395	92	98	158	43	163	185	38
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1387	2976	952	1287	2440		1171	1178		836	1151	
Flt Permitted	0.41	1.00	1.00	0.35	1.00		0.58	1.00		0.60	1.00	
Satd. Flow (perm)	596	2976	952	470	2440		714	1178		531	1151	
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)	68	628	143	45	429	100	107	172	47	177	201	41
RTOR Reduction (vph)	0	0	61	0	23	0	0	11	0	0	9	0
Lane Group Flow (vph)	68	628	82	45	506	0	107	208	0	177	233	0
Confl. Peds. (#/hr)			1		1							
Heavy Vehicles (%)	3%	4%	18%	11%	5%	5%	22%	17%	3%	71%	19%	10%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	23.6	23.6	23.6	23.6	23.6		26.9	26.9		26.9	26.9	
Effective Green, g (s)	26.6	26.6	26.6	26.6	26.6		28.9	28.9		28.9	28.9	
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.42		0.46	0.46		0.46	0.46	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	249	1246	398	196	1022		324	536		241	523	
v/s Ratio Prot		c0.21			0.21			0.18			0.20	
v/s Ratio Perm	0.11		0.09	0.10			0.15			c0.33		
v/c Ratio	0.27	0.50	0.21	0.23	0.50		0.33	0.39		0.73	0.45	
Uniform Delay, d1	12.1	13.6	11.7	11.9	13.5		11.1	11.4		14.2	11.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.3	0.3	0.6	0.4		0.6	0.5		11.0	0.6	
Delay (s)	12.7	13.9	12.0	12.5	13.9		11.7	11.9		25.2	12.4	
Level of Service	B	B	B	B	B		B	B		C	B	
Approach Delay (s)		13.5			13.8			11.8			17.8	
Approach LOS		B			B			B			B	

Intersection Summary

HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	63.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
Future Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	80.0			80.0			80.0			80.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.965			0.998			0.952			0.976	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1409	1382	0	1409	1449	0	1409	1289	0	1075	1195	0
Flt Permitted	0.643			0.664			0.613			0.450		
Satd. Flow (perm)	954	1382	0	985	1449	0	909	1289	0	509	1195	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			1			56			23	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2099.4			714.3	
Travel Time (s)		30.1			38.7			151.2			51.4	
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%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Adj. Flow (vph)	42	112	34	110	179	3	38	330	153	16	197	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	146	0	110	182	0	38	483	0	16	234	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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
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	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0	24.0		24.0	24.0	
Total Split (s)	24.0	24.0		24.0	24.0		36.0	36.0		36.0	36.0	
Total Split (%)	40.0%	40.0%		40.0%	40.0%		60.0%	60.0%		60.0%	60.0%	
Maximum Green (s)	18.0	18.0		18.0	18.0		30.0	30.0		30.0	30.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
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		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	11.0	11.0		11.2	11.2		25.4	25.4		25.4	25.4	
Actuated g/C Ratio	0.25	0.25		0.26	0.26		0.58	0.58		0.58	0.58	
v/c Ratio	0.18	0.40		0.44	0.49		0.07	0.63		0.05	0.33	
Control Delay	16.7	16.6		21.7	20.5		7.7	13.7		7.9	9.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.7	16.6		21.7	20.5		7.7	13.7		7.9	9.0	
LOS	B	B		C	C		A	B		A	A	
Approach Delay		16.7			20.9			13.3			8.9	
Approach LOS		B			C			B			A	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 43.9

Natural Cycle: 60

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 14.7

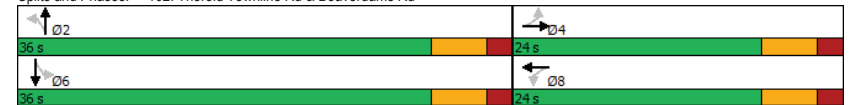
Intersection LOS: B

Intersection Capacity Utilization 68.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 102: Thorold Townline Rd & Beaverdams Rd

Thorold Townline & Highway 20, Thorold
PTSL (210565)Synchro 11 Report
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Queues

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

AM Peak Hour

	↖	→	↗	←	↖	↑	↗	↓
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	42	146	110	182	38	483	16	234
v/c Ratio	0.18	0.40	0.44	0.49	0.07	0.63	0.05	0.33
Control Delay	16.7	16.6	21.7	20.5	7.7	13.7	7.9	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.7	16.6	21.7	20.5	7.7	13.7	7.9	9.0
Queue Length 50th (m)	2.5	7.6	7.2	11.9	1.5	24.3	0.6	9.6
Queue Length 95th (m)	10.3	23.9	22.7	32.6	6.3	#74.1	3.6	28.0
Internal Link Dist (m)		394.6		513.1		2075.4		690.3
Turn Bay Length (m)	40.0		40.0		40.0		40.0	
Base Capacity (vph)	418	621	432	636	657	947	368	870
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	0.10	0.24	0.25	0.29	0.06	0.51	0.04	0.27

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

AM Peak Hour

	↖	→	↗	↖	←	↖	↗	↑	↗	↖	↓	↖
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
Future Volume (vph)	39	103	31	101	165	3	35	304	141	15	181	34
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1409	1382		1409	1448		1409	1289		1075	1196	
Flt Permitted	0.64	1.00		0.66	1.00		0.61	1.00		0.45	1.00	
Satd. Flow (perm)	953	1382		985	1448		909	1289		510	1196	
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)	42	112	34	110	179	3	38	330	153	16	197	37
RTOR Reduction (vph)	0	21	0	0	1	0	0	27	0	0	11	0
Lane Group Flow (vph)	42	125	0	110	181	0	38	456	0	16	223	0
Heavy Vehicles (%)	0%	1%	12%	0%	2%	11%	0%	14%	0%	31%	23%	11%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.3	9.3		9.3	9.3		23.6	23.6		23.6	23.6	
Effective Green, g (s)	9.3	9.3		9.3	9.3		23.6	23.6		23.6	23.6	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.53	0.53		0.53	0.53	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	197	286		204	299		477	677		268	628	
v/s Ratio Prot		0.09			c0.13			c0.35			0.19	
v/s Ratio Perm	0.04			0.11			0.04			0.03		
v/c Ratio	0.21	0.44		0.54	0.61		0.08	0.67		0.06	0.36	
Uniform Delay, d1	14.8	15.5		15.9	16.1		5.3	7.8		5.2	6.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	1.1		2.7	3.5		0.1	2.7		0.1	0.3	
Delay (s)	15.3	16.6		18.6	19.6		5.3	10.5		5.3	6.6	
Level of Service	B	B		B	B		A	B		A	A	
Approach Delay (s)		16.3			19.2			10.1			6.5	
Approach LOS		B			B			B			A	

Intersection Summary

HCM 2000 Control Delay	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	44.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2030
AM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		 	 		 	
Traffic Volume (vph)	149	552	437	94	222	306
Future Volume (vph)	149	552	437	94	222	306
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt			0.973		0.922	
Flt Protected		0.989			0.979	
Satd. Flow (prot)	0	2104	2465	0	1199	0
Flt Permitted		0.989			0.979	
Satd. Flow (perm)	0	2104	2465	0	1199	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	27%	5%	5%	0%	7%	15%
Adj. Flow (vph)	162	600	475	102	241	333
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	762	577	0	574	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type: Roundabout						
Intersection Capacity Utilization 100.8%			ICU Level of Service G			
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2030
AM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Movement						
Right Turn Channelized						
Traffic Volume (veh/h)	149	552	437	94	222	306
Future Volume (veh/h)	149	552	437	94	222	306
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	162	600	475	102	241	333
Approach Volume (veh/h)		762	577		574	
Crossing Volume (veh/h)		241	162		475	
High Capacity (veh/h)		1147	1220		952	
High v/c (veh/h)		0.66	0.47		0.60	
Low Capacity (veh/h)		945	1012		771	
Low v/c (veh/h)		0.81	0.57		0.74	
Intersection Summary						
Maximum v/c High	0.66					
Maximum v/c Low	0.81					
Intersection Capacity Utilization	100.8%			ICU Level of Service G		

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2030
AM Peak Hour

Intersection					
Intersection Delay, s/veh	9.8				
Intersection LOS	A				
Approach	EB		WB		SB
Entry Lanes	2		2		1
Conflicting Circle Lanes	2		2		2
Adj Approach Flow, veh/h	762		577		574
Demand Flow Rate, veh/h	836		601		641
Vehicles Circulating, veh/h	258		206		499
Vehicles Exiting, veh/h	882		888		308
Ped Vol Crossing Leg, #/h	0		0		1
Ped Cap Adj	1.000		1.000		1.000
Approach Delay, s/veh	7.6		5.7		16.8
Approach LOS	A		A		C
Lane	Left	Right	Left	Right	Left
Designated Moves	LT	TR	LT	TR	LR
Assumed Moves	LT	TR	LT	TR	LR
RT Channelized					
Lane Util	0.470	0.530	0.469	0.531	1.000
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328	4.645	4.328	4.328
Entry Flow, veh/h	393	443	282	319	641
Cap Entry Lane, veh/h	1065	1140	1117	1192	929
Entry HV Adj Factor	0.911	0.912	0.962	0.959	0.895
Flow Entry, veh/h	358	404	271	306	574
Cap Entry, veh/h	970	1040	1074	1143	832
V/C Ratio	0.369	0.388	0.253	0.268	0.690
Control Delay, s/veh	7.7	7.6	5.7	5.6	16.8
LOS	A	A	A	A	C
95th %tile Queue, veh	2	2	1	1	6

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2030
AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	71	91	64	263	179	30
Future Volume (vph)	71	91	64	263	179	30
Ideal Flow (vphpl)	1483	1483	1504	1629	1629	1351
Storage Length (m)	0.0	0.0	50.0			50.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.5		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.924					0.850
Flt Protected	0.979		0.950			
Satd. Flow (prot)	1315	0	1401	1597	1597	1126
Flt Permitted	0.979		0.950			
Satd. Flow (perm)	1315	0	1401	1597	1597	1126
Link Speed (k/h)	50			50	50	
Link Distance (m)	288.9			148.9	150.9	
Travel Time (s)	20.8			10.7	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	99	70	286	195	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	70	286	195	33
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	1.37	1.37	1.34	1.22	1.22	1.53
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	37.7%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2030
AM Peak Hour

	EBL	EBR	NBL	NBT	SBT	SBR
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	W
Traffic Volume (veh/h)	71	91	64	263	179	30
Future Volume (Veh/h)	71	91	64	263	179	30
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)	77	99	70	286	195	33
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				378		
pX, platoon unblocked						
vC, conflicting volume	621	195	228			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	621	195	228			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	88	95			
cM capacity (veh/h)	427	846	1340			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	176	70	286	195	33	
Volume Left	77	70	0	0	0	
Volume Right	99	0	0	0	33	
cSH	592	1340	1700	1700	1700	
Volume to Capacity	0.30	0.05	0.17	0.11	0.02	
Queue Length 95th (m)	9.9	1.3	0.0	0.0	0.0	
Control Delay (s)	13.6	7.8	0.0	0.0	0.0	
Lane LOS	B	A				
Approach Delay (s)	13.6	1.5		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			3.9			
Intersection Capacity Utilization			37.7%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2030
AM Peak Hour

	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	W
Traffic Volume (vph)	4	8	3	331	201	1
Future Volume (vph)	4	8	3	331	201	1
Ideal Flow (vphpl)	1483	1483	1504	1629	1388	1388
Storage Length (m)	0.0	0.0	15.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		45.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.907			0.999		
Flt Protected	0.985		0.950			
Satd. Flow (prot)	1299	0	1401	1597	1359	0
Flt Permitted	0.985		0.950			
Satd. Flow (perm)	1299	0	1401	1597	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	153.4			150.9	2099.4	
Travel Time (s)	11.0			10.9	151.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	9	3	360	218	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	13	0	3	360	219	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	1.37	1.37	1.34	1.22	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 30.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2030
AM Peak Hour

	EBL	EBR	NBL	NBT	SBT	SBR
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	
Traffic Volume (veh/h)	4	8	3	331	201	1
Future Volume (Veh/h)	4	8	3	331	201	1
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)	4	9	3	360	218	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	584	218	219			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	584	218	219			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	100			
cM capacity (veh/h)	473	821	1350			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	13	3	360	219		
Volume Left	4	3	0	0		
Volume Right	9	0	0	1		
cSH	669	1350	1700	1700		
Volume to Capacity	0.02	0.00	0.21	0.13		
Queue Length 95th (m)	0.5	0.1	0.0	0.0		
Control Delay (s)	10.5	7.7	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	10.5	0.1		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			30.3%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2030
AM Peak Hour

	EBL	EBR	NBL	NBT	SBT	SBR
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	
Traffic Volume (vph)	48	138	34	279	248	22
Future Volume (vph)	48	138	34	279	248	22
Ideal Flow (vphpl)	1483	1483	1504	1629	1629	1351
Storage Length (m)	0.0	0.0	25.0			50.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.5		50.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900					0.850
Flt Protected	0.987		0.950			
Satd. Flow (prot)	1292	0	1401	1597	1597	1126
Flt Permitted	0.987		0.950			
Satd. Flow (perm)	1292	0	1401	1597	1597	1126
Link Speed (k/h)	50			50	50	
Link Distance (m)	208.4			229.0	148.9	
Travel Time (s)	15.0			16.5	10.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	150	37	303	270	24
Shared Lane Traffic (%)						
Lane Group Flow (vph)	202	0	37	303	270	24
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	1.37	1.37	1.34	1.22	1.22	1.53
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 42.9%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
203: Thorold Townline Rd & Street C

Total - 2030
AM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	48	138	34	279	248	22
Future Volume (Veh/h)	48	138	34	279	248	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)	52	150	37	303	270	24
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				229		
pX, platoon unblocked						
vC, conflicting volume	647	270	294			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	647	270	294			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	88	80	97			
cM capacity (veh/h)	423	769	1268			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	202	37	303	270	24	
Volume Left	52	37	0	0	0	
Volume Right	150	0	0	0	24	
cSH	635	1268	1700	1700	1700	
Volume to Capacity	0.32	0.03	0.18	0.16	0.01	
Queue Length 95th (m)	10.9	0.7	0.0	0.0	0.0	
Control Delay (s)	13.3	7.9	0.0	0.0	0.0	
Lane LOS	B	A				
Approach Delay (s)	13.3	0.9		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization			42.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Queuing and Blocking Report

Total - 2030
AM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (m)	30.7	58.0	55.1	29.4	26.5	41.7	47.7	42.9	58.7	85.0	66.1
Average Queue (m)	11.3	26.8	29.9	13.0	7.7	20.9	22.7	15.7	23.2	39.9	25.7
95th Queue (m)	23.1	46.2	47.8	24.3	19.2	34.8	39.1	32.4	45.3	70.0	54.2
Link Distance (m)		903.7	903.7			568.1	568.1		765.2		205.8
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (m)	90.0			20.0	55.0			50.0		50.0	
Storage Blk Time (%)			18	1	0			0	1	6	1
Queuing Penalty (veh)			23	4	0			0	1	13	1

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	23.2	31.8	34.5	36.1	20.3	72.7	20.1	45.1
Average Queue (m)	7.9	14.4	12.0	13.3	5.7	35.0	3.4	20.5
95th Queue (m)	18.3	26.2	25.4	27.2	14.3	60.9	13.1	38.0
Link Distance (m)		408.4		522.6		2075.1		704.1
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	40.0		40.0		40.0		40.0	
Storage Blk Time (%)		0	0	0		4		1
Queuing Penalty (veh)		0	1	0		1		0

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	EB	WB	WB	SB
Directions Served	LT	T	T	TR	LR
Maximum Queue (m)	32.4	2.6	20.1	18.6	73.0
Average Queue (m)	12.0	0.1	6.9	1.2	24.2
95th Queue (m)	24.5	1.8	17.1	8.3	52.7
Link Distance (m)	994.6	994.6	903.7	903.7	445.5
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Queuing and Blocking Report

Total - 2030
AM Peak Hour

Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	26.4	14.5
Average Queue (m)	10.5	3.0
95th Queue (m)	19.5	10.6
Link Distance (m)	274.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	50.0	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	9.2	5.3
Average Queue (m)	3.3	0.2
95th Queue (m)	10.3	2.2
Link Distance (m)	143.0	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	15.0	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	24.3	10.6
Average Queue (m)	11.2	2.3
95th Queue (m)	19.9	8.9
Link Distance (m)	194.2	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	25.0	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 44

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Future Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Storage Length (m)	90.0		20.0	55.0		0.0	50.0		0.0	50.0		0.0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (m)	100.0			80.0			100.0			100.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.970			0.960			0.960	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1348	3034	1054	1401	2498	0	1299	1246	0	1299	1233	0
Flt Permitted	0.180			0.269			0.390			0.412		
Satd. Flow (perm)	255	3034	1054	397	2498	0	533	1246	0	563	1233	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			135		47			25			25	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		936.7			581.5			783.0			217.0	
Travel Time (s)		67.4			41.9			56.4			15.6	
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 (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Adj. Flow (vph)	87	821	213	58	841	207	173	265	95	159	279	101
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	821	213	58	1048	0	173	360	0	159	380	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												
Headway Factor	1.34	1.22	1.53	1.34	1.48	1.48	1.34	1.48	1.48	1.34	1.48	1.48
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	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	0.0	
Detector 1 Position(m)	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	0.6		2.0	0.6	
Detector 1 Type	CI+Ex	CI+Ex	CI+Ex	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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	
Detector 1 Queue (s)	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	
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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	42.0	42.0	42.0	42.0	42.0		39.0	39.0		39.0	39.0	
Total Split (s)	48.0	48.0	48.0	48.0	48.0		42.0	42.0		42.0	42.0	
Total Split (%)	53.3%	53.3%	53.3%	53.3%	53.3%		46.7%	46.7%		46.7%	46.7%	
Maximum Green (s)	41.0	41.0	41.0	41.0	41.0		36.0	36.0		36.0	36.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0	-3.0	-3.0	-3.0		-2.0	-2.0		-2.0	-2.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		15.0	15.0	
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0		14.0	14.0		14.0	14.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	38.4	38.4	38.4	38.4	38.4		30.9	30.9		30.9	30.9	
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49		0.40	0.40		0.40	0.40	
v/c Ratio	0.70	0.55	0.36	0.30	0.83		0.82	0.71		0.71	0.75	
Control Delay	50.8	16.2	7.5	18.7	24.5		54.1	27.6		41.2	30.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	50.8	16.2	7.5	18.7	24.5		54.1	27.6		41.2	30.3	
LOS	D	B	A	B	C		D	C		D	C	
Approach Delay		17.2			24.2			36.2			33.5	
Approach LOS		B			C			D			C	

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 77.7

Natural Cycle: 85

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 25.3

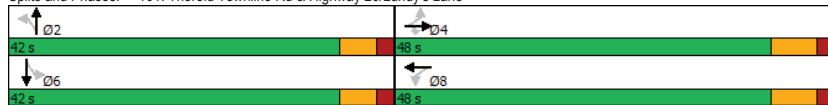
Intersection LOS: C

Intersection Capacity Utilization 105.0%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 101: Thorold Townline Rd & Highway 20/Lundy's Lane



Queues

101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	87	821	213	58	1048	173	360	159	380
v/c Ratio	0.70	0.55	0.36	0.30	0.83	0.82	0.71	0.71	0.75
Control Delay	50.8	16.2	7.5	18.7	24.5	54.1	27.6	41.2	30.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.8	16.2	7.5	18.7	24.5	54.1	27.6	41.2	30.3
Queue Length 50th (m)	11.6	51.8	7.4	6.0	78.9	26.2	47.7	22.7	52.1
Queue Length 95th (m)	#39.7	70.4	22.5	15.8	#111.9	#63.7	80.9	#54.4	88.5
Internal Link Dist (m)		912.7			557.5		759.0		193.0
Turn Bay Length (m)	90.0		20.0	55.0		50.0		50.0	
Base Capacity (vph)	153	1822	687	238	1519	276	658	292	651
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.45	0.31	0.24	0.69	0.63	0.55	0.54	0.58

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
101: Thorold Townline Rd & Highway 20/Lundy's Lane

Total - 2030
PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↱	↰	↱	↱	↰	↱	↱	↰	↱	↱
Traffic Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Future Volume (vph)	80	755	196	53	774	190	159	244	87	146	257	93
Ideal Flow (vphpl)	1504	1629	1351	1504	1388	1388	1504	1388	1388	1504	1388	1388
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.97		1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1348	3034	1054	1401	2499		1299	1246		1299	1233	
Flt Permitted	0.18	1.00	1.00	0.27	1.00		0.39	1.00		0.41	1.00	
Satd. Flow (perm)	255	3034	1054	396	2499		533	1246		563	1233	
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)	87	821	213	58	841	207	173	265	95	159	279	101
RTOR Reduction (vph)	0	0	68	0	24	0	0	15	0	0	15	0
Lane Group Flow (vph)	87	821	145	58	1024	0	173	345	0	159	365	0
Heavy Vehicles (%)	6%	2%	9%	2%	3%	0%	10%	8%	4%	10%	7%	11%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	35.2	35.2	35.2	35.2	35.2		28.7	28.7		28.7	28.7	
Effective Green, g (s)	38.2	38.2	38.2	38.2	38.2		30.7	30.7		30.7	30.7	
Actuated g/C Ratio	0.50	0.50	0.50	0.50	0.50		0.40	0.40		0.40	0.40	
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	1507	523	196	1241		212	497		224	492	
v/s Ratio Prot		0.27			c0.41			0.28			0.30	
v/s Ratio Perm	0.34		0.14	0.15			c0.32			0.28		
v/c Ratio	0.69	0.54	0.28	0.30	0.83		0.82	0.69		0.71	0.74	
Uniform Delay, d1	14.8	13.4	11.3	11.4	16.5		20.6	19.2		19.4	19.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.1	0.4	0.3	0.8	4.6		20.9	4.2		9.9	6.0	
Delay (s)	29.9	13.8	11.6	12.3	21.1		41.5	23.4		29.2	25.7	
Level of Service	C	B	B	B	C		D	C		C	C	
Approach Delay (s)		14.6			20.7			29.3			26.7	
Approach LOS		B			C			C			C	
Intersection Summary												
HCM 2000 Control Delay		21.0			HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio		0.82										
Actuated Cycle Length (s)		76.9			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		105.0%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

Lanes, Volumes, Timings
102: Thorold Townline Rd & Beaverdams Rd

Total - 2030
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↱	↰	↱	↱	↰	↱	↱	↰	↱	↱
Traffic Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
Future Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Storage Length (m)	40.0		0.0	40.0		0.0	40.0		0.0	40.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	80.0			80.0			80.0			80.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.975			0.979			0.948			0.974	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1409	1427	0	1409	1432	0	1368	1328	0	1409	1349	0
Flt Permitted	0.609			0.541			0.381			0.418		
Satd. Flow (perm)	903	1427	0	802	1432	0	549	1328	0	620	1349	0
Right Turn on Red		Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)		15			12			44			18	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		418.6			537.1			2106.3			714.3	
Travel Time (s)		30.1			38.7			151.7			51.4	
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%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Adj. Flow (vph)	45	246	50	199	208	33	50	285	150	40	389	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	296	0	199	241	0	50	435	0	40	471	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												
Headway Factor	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
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	CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+Ex		CI+Ex	CI+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		CI+Ex			CI+Ex			CI+Ex			CI+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	

Lanes, Volumes, Timings

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		24.0	24.0		24.0	24.0	
Total Split (s)	37.0	37.0		37.0	37.0		43.0	43.0		43.0	43.0	
Total Split (%)	46.3%	46.3%		46.3%	46.3%		53.8%	53.8%		53.8%	53.8%	
Maximum Green (s)	31.0	31.0		31.0	31.0		37.0	37.0		37.0	37.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
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		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	21.3	21.3		21.3	21.3		25.6	25.6		25.6	25.6	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.43	0.43		0.43	0.43	
v/c Ratio	0.14	0.58		0.70	0.47		0.21	0.74		0.15	0.81	
Control Delay	16.3	21.2		33.6	18.9		15.1	22.5		13.7	27.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.3	21.2		33.6	18.9		15.1	22.5		13.7	27.8	
LOS	B	C		C	B		B	C		B	C	
Approach Delay		20.5			25.6			21.7			26.7	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 60.2

Natural Cycle: 55

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 23.9

Intersection LOS: C

Intersection Capacity Utilization 86.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 102: Thorold Townline Rd & Beaverdams Rd

Queues

102: Thorold Townline Rd & Beaverdams Rd

Total - 2030

PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	45	296	199	241	50	435	40	471
v/c Ratio	0.14	0.58	0.70	0.47	0.21	0.74	0.15	0.81
Control Delay	16.3	21.2	33.6	18.9	15.1	22.5	13.7	27.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.3	21.2	33.6	18.9	15.1	22.5	13.7	27.8
Queue Length 50th (m)	3.4	25.1	19.0	19.5	3.5	35.5	2.7	43.1
Queue Length 95th (m)	11.6	57.9	#55.6	46.1	12.0	82.1	9.7	#98.6
Internal Link Dist (m)		394.6		513.1		2082.3		690.3
Turn Bay Length (m)	40.0		40.0		40.0		40.0	
Base Capacity (vph)	514	820	457	821	365	899	413	904
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	0.09	0.36	0.44	0.29	0.14	0.48	0.10	0.52

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
102: Thorold Townline Rd & Beaverdams Rd

Total - 2030
PM Peak Hour

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
Future Volume (vph)	41	226	46	183	191	30	46	262	138	37	358	75
Ideal Flow (vphpl)	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483	1483
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.98		1.00	0.95		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)	1409	1426		1409	1432		1368	1328		1409	1349	
Flt Permitted	0.61	1.00		0.54	1.00		0.38	1.00		0.42	1.00	
Satd. Flow (perm)	903	1426		802	1432		549	1328		620	1349	
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)	45	246	50	199	208	33	50	285	150	40	389	82
RTOR Reduction (vph)	0	10	0	0	8	0	0	25	0	0	10	0
Lane Group Flow (vph)	45	286	0	199	233	0	50	410	0	40	461	0
Heavy Vehicles (%)	0%	1%	3%	0%	1%	4%	3%	9%	0%	0%	6%	12%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	21.3	21.3		21.3	21.3		25.6	25.6		25.6	25.6	
Effective Green, g (s)	21.3	21.3		21.3	21.3		25.6	25.6		25.6	25.6	
Actuated g/C Ratio	0.36	0.36		0.36	0.36		0.43	0.43		0.43	0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	326	515		290	517		238	577		269	586	
v/s Ratio Prot		0.20			0.16			0.31			c0.34	
v/s Ratio Perm	0.05			c0.25			0.09			0.06		
v/c Ratio	0.14	0.56		0.69	0.45		0.21	0.71		0.15	0.79	
Uniform Delay, d1	12.6	15.0		16.0	14.3		10.4	13.6		10.1	14.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	1.3		6.6	0.6		0.4	4.1		0.3	6.9	
Delay (s)	12.8	16.3		22.6	15.0		10.8	17.7		10.3	21.2	
Level of Service	B	B		C	B		B	B		B	C	
Approach Delay (s)		15.9			18.4			17.0			20.3	
Approach LOS		B			B			B			C	
Intersection Summary												
HCM 2000 Control Delay		18.1			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.74										
Actuated Cycle Length (s)		58.9			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		86.0%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

Lanes, Volumes, Timings
103: Highway 20 & Barker Parkway

Total - 2030
PM Peak Hour

	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↱	↰	↱	↰	↱
Traffic Volume (vph)	355	843	770	256	188	257
Future Volume (vph)	355	843	770	256	188	257
Ideal Flow (vphpl)	1228	1228	1388	1388	1483	1483
Lane Util. Factor	0.95	0.95	0.95	0.95	1.00	1.00
Frt			0.963		0.922	
Flt Protected		0.985			0.979	
Satd. Flow (prot)	0	2262	2466	0	1266	0
Flt Permitted		0.985			0.979	
Satd. Flow (perm)	0	2262	2466	0	1266	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		1017.3	936.7		470.3	
Travel Time (s)		73.2	67.4		33.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	1%	3%	3%	0%	10%
Adj. Flow (vph)	386	916	837	278	204	279
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1302	1115	0	483	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						
Headway Factor	1.71	1.71	1.48	1.48	1.37	1.37
Turning Speed (k/h)	25			15	25	15
Sign Control		Yield	Yield		Yield	
Intersection Summary						
Area Type:	Other					
Control Type:	Roundabout					
Intersection Capacity Utilization 135.9%	ICU Level of Service H					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
103: Highway 20 & Barker Parkway

Total - 2030
PM Peak Hour

						
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	355	843	770	256	188	257
Future Volume (veh/h)	355	843	770	256	188	257
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	386	916	837	278	204	279
Approach Volume (veh/h)	1302		1115		483	
Crossing Volume (veh/h)	204		386		837	
High Capacity (veh/h)	1180		1022		711	
High v/c (veh/h)	1.10		1.09		0.68	
Low Capacity (veh/h)	976		834		559	
Low v/c (veh/h)	1.33		1.34		0.86	
Intersection Summary						
Maximum v/c High	1.10					
Maximum v/c Low	1.34					
Intersection Capacity Utilization	135.9%		ICU Level of Service		H	

HCM 6th Roundabout
103: Highway 20 & Barker Parkway

Total - 2030
PM Peak Hour

Intersection					
Intersection Delay, s/veh	13.2				
Intersection LOS	B				
Approach	EB		WB		SB
Entry Lanes	2		2		1
Conflicting Circle Lanes	2		2		2
Adj Approach Flow, veh/h	1302		1115		483
Demand Flow Rate, veh/h	1323		1148		511
Vehicles Circulating, veh/h	204		398		862
Vehicles Exiting, veh/h	1169		1129		684
Ped Vol Crossing Leg, #/h	0		0		0
Ped Cap Adj	1.000		1.000		1.000
Approach Delay, s/veh	10.2		12.1		24.0
Approach LOS	B		B		C
Lane	Left	Right	Left	Right	Left
Designated Moves	LT	TR	LT	TR	LR
Assumed Moves	LT	TR	LT	TR	LR
RT Channelized					
Lane Util	0.470	0.530	0.470	0.530	1.000
Follow-Up Headway, s	2.667	2.535	2.667	2.535	2.535
Critical Headway, s	4.645	4.328	4.645	4.328	4.328
Entry Flow, veh/h	622	701	540	608	511
Cap Entry Lane, veh/h	1119	1194	936	1012	682
Entry HV Adj Factor	0.984	0.984	0.970	0.972	0.945
Flow Entry, veh/h	612	690	524	591	483
Cap Entry, veh/h	1101	1175	908	984	645
V/C Ratio	0.556	0.587	0.577	0.601	0.749
Control Delay, s/veh	10.1	10.3	12.1	12.0	24.0
LOS	B	B	B	B	C
95th %tile Queue, veh	4	4	4	4	7

Lanes, Volumes, Timings
201: Thorold Townline Rd & Street A

Total - 2030
PM Peak Hour

	↖	↗	↖	↗	↘	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	W
Traffic Volume (vph)	82	103	189	281	384	69
Future Volume (vph)	82	103	189	281	384	69
Ideal Flow (vphpl)	1483	1483	1504	1629	1629	1351
Storage Length (m)	0.0	0.0	50.0			50.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.5		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.925					0.850
Flt Protected	0.978		0.950			
Satd. Flow (prot)	1315	0	1401	1597	1597	1126
Flt Permitted	0.978		0.950			
Satd. Flow (perm)	1315	0	1401	1597	1597	1126
Link Speed (k/h)	50			50	50	
Link Distance (m)	304.3			152.9	152.0	
Travel Time (s)	21.9			11.0	10.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	89	112	205	305	417	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	201	0	205	305	417	75
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	1.37	1.37	1.34	1.22	1.22	1.53
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 60.7%	ICU Level of Service B					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
201: Thorold Townline Rd & Street A

Total - 2030
PM Peak Hour

	↖	↗	↖	↗	↘	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	W
Traffic Volume (veh/h)	82	103	189	281	384	69
Future Volume (Veh/h)	82	103	189	281	384	69
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)	89	112	205	305	417	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				370		
pX, platoon unblocked						
vC, conflicting volume	1132	417	492			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1132	417	492			
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	82	81			
cM capacity (veh/h)	182	636	1071			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	201	205	305	417	75	
Volume Left	89	205	0	0	0	
Volume Right	112	0	0	0	75	
cSH	302	1071	1700	1700	1700	
Volume to Capacity	0.67	0.19	0.18	0.25	0.04	
Queue Length 95th (m)	35.4	5.6	0.0	0.0	0.0	
Control Delay (s)	37.8	9.2	0.0	0.0	0.0	
Lane LOS	E	A				
Approach Delay (s)	37.8	3.7		0.0		
Approach LOS	E					
Intersection Summary						
Average Delay			7.9			
Intersection Capacity Utilization			60.7%		ICU Level of Service	B
Analysis Period (min)			15			

Lanes, Volumes, Timings
202: Thorold Townline Rd & Street B

Total - 2030
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	3	5	9	354	448	4
Future Volume (vph)	3	5	9	354	448	4
Ideal Flow (vphpl)	1483	1483	1504	1629	1388	1388
Storage Length (m)	0.0	0.0	15.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		45.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.916			0.999		
Flt Protected	0.982		0.950			
Satd. Flow (prot)	1308	0	1401	1597	1359	0
Flt Permitted	0.982		0.950			
Satd. Flow (perm)	1308	0	1401	1597	1359	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	79.3			152.0	2106.3	
Travel Time (s)	5.7			10.9	151.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	5	10	385	487	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	10	385	491	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	1.37	1.37	1.34	1.22	1.48	1.48
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 42.6%	ICU Level of Service A					
Analysis Period (min) 15						

HCM Unsignalized Intersection Capacity Analysis
202: Thorold Townline Rd & Street B

Total - 2030
PM Peak Hour

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	5	9	354	448	4
Future Volume (Veh/h)	3	5	9	354	448	4
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)	3	5	10	385	487	4
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	894	489	491			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	894	489	491			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	309	579	1072			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	8	10	385	491		
Volume Left	3	10	0	0		
Volume Right	5	0	0	4		
cSH	436	1072	1700	1700		
Volume to Capacity	0.02	0.01	0.23	0.29		
Queue Length 95th (m)	0.4	0.2	0.0	0.0		
Control Delay (s)	13.4	8.4	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	13.4	0.2		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			42.6%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings
203: Thorold Townline Rd & Street C

Total - 2030
PM Peak Hour

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	38	107	83	432	389	98
Future Volume (vph)	38	107	83	432	389	98
Ideal Flow (vphpl)	1483	1483	1504	1629	1629	1351
Storage Length (m)	0.0	0.0	30.0			50.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.5		75.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.900					0.850
Flt Protected	0.987		0.950			
Satd. Flow (prot)	1292	0	1401	1597	1597	1126
Flt Permitted	0.987		0.950			
Satd. Flow (perm)	1292	0	1401	1597	1597	1126
Link Speed (k/h)	50			50	50	
Link Distance (m)	214.7			217.0	152.9	
Travel Time (s)	15.5			15.6	11.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	41	116	90	470	423	107
Shared Lane Traffic (%)						
Lane Group Flow (vph)	157	0	90	470	423	107
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	1.37	1.37	1.34	1.22	1.22	1.53
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	50.8%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
203: Thorold Townline Rd & Street C

Total - 2030
PM Peak Hour

	EBL	EBR	NBL	NBT	SBT	SBR
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	W
Traffic Volume (veh/h)	38	107	83	432	389	98
Future Volume (Veh/h)	38	107	83	432	389	98
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)	41	116	90	470	423	107
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				217		
pX, platoon unblocked						
vC, conflicting volume	1073	423	530			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1073	423	530			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	82	82	91			
cM capacity (veh/h)	223	631	1037			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	157	90	470	423	107	
Volume Left	41	90	0	0	0	
Volume Right	116	0	0	0	107	
cSH	427	1037	1700	1700	1700	
Volume to Capacity	0.37	0.09	0.28	0.25	0.06	
Queue Length 95th (m)	13.3	2.3	0.0	0.0	0.0	
Control Delay (s)	18.3	8.8	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	18.3	1.4		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			50.8%		ICU Level of Service	A
Analysis Period (min)			15			

Queuing and Blocking Report

Total - 2030
PM Peak Hour

Intersection: 101: Thorold Townline Rd & Highway 20/Lundy's Lane

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR	
Maximum Queue (m)	66.3	63.4	68.2	51.5	30.9	76.8	85.7	64.7	74.7	47.5	86.6	
Average Queue (m)	27.7	35.1	40.0	17.3	10.3	47.4	54.3	29.7	35.8	23.4	45.8	
95th Queue (m)	57.7	55.3	58.6	33.8	22.9	73.7	80.6	51.8	62.5	40.9	76.6	
Link Distance (m)	903.7		903.7		568.1		568.1		765.2		194.0	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	90.0				20.0		55.0		50.0		50.0	
Storage Blk Time (%)	0		29		4		4		1		7	
Queuing Penalty (veh)	0		56		14		2		7		6	

Intersection: 102: Thorold Townline Rd & Beaverdams Rd

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (m)	16.8	64.1	47.4	49.4	21.2	71.6	22.6	75.4
Average Queue (m)	6.6	29.4	24.1	19.0	8.4	37.6	7.5	39.8
95th Queue (m)	16.3	51.9	41.1	37.1	18.1	63.7	18.8	65.5
Link Distance (m)	408.4		522.6		2082.1		704.1	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	40.0		40.0		40.0		40.0	
Storage Blk Time (%)	3		2		7		7	
Queuing Penalty (veh)	1		4		3		3	

Intersection: 103: Highway 20 & Barker Parkway

Movement	EB	WB	WB	SB
Directions Served	LT	T	TR	LR
Maximum Queue (m)	33.0	39.1	42.0	64.8
Average Queue (m)	14.8	18.0	8.6	26.5
95th Queue (m)	27.6	31.1	28.3	50.3
Link Distance (m)	994.6	903.7	903.7	445.5
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Queuing and Blocking Report

Total - 2030
PM Peak Hour

Intersection: 201: Thorold Townline Rd & Street A

Movement	EB	NB	SB
Directions Served	LR	L	R
Maximum Queue (m)	54.7	25.8	6.7
Average Queue (m)	18.6	11.9	0.5
95th Queue (m)	39.4	22.1	3.4
Link Distance (m)	290.2		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	50.0		50.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 202: Thorold Townline Rd & Street B

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (m)	10.3	9.1
Average Queue (m)	2.0	0.8
95th Queue (m)	8.3	5.1
Link Distance (m)	68.7	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)	15.0	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 203: Thorold Townline Rd & Street C

Movement	EB	NB	SB
Directions Served	LR	L	R
Maximum Queue (m)	26.0	15.8	6.4
Average Queue (m)	11.3	6.7	0.4
95th Queue (m)	21.0	15.2	3.2
Link Distance (m)	200.4		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	30.0		50.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 110