

CITY OF BRAMPTON

BRAMPTON VODDEN CYLCING FACILITIES DESIGN FEASIBILITY TRAFFIC OPERATIONS REVIEW

JUNE 11, 2020





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CITY OF BRAMPTON

PROJECT NO.: 19M-01963-00
DATE: JUNE 11, 2020

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June 11, 2020

CITY OF BRAMPTON
2 Wellington Street West
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Attention: Nelson Cadete

CC: Ismet Medic, Brittany Chung (WSP)

Dear Sir:

Subject: Brampton Vodden Cycling Facilities Design Feasibility - Traffic Operations Review

WSP Canada Group Limited (WSP) is pleased to present this report on the traffic operations review for the Brampton Vodden Cycling Facilities Design Feasibility Study.

Based on the enclosed findings, it is expected that the majority of the study intersections operate within acceptable levels of service (LOS) with the exception of Vodden Street East & Howden Blvd, as a further review of the turning movement counts and signal timing plans is required for model calibration. The proposed future road network reconfigurations to accommodate the dedicated bike lanes will also adequately serve the existing traffic demand. Signal timing optimizations at several intersections will be required and several critical exclusive turning lanes may need to be extended to manage queues.

Please do not hesitate to contact us if you have any questions or comments.

Sincerely,

J. David McLaughlin, BA, MES, MCIP, RPP
National Active Transportation Practice Manager
& Senior Project Manager
Planning and Advisory, Transportation

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1 INTRODUCTION

This report provides a summary of an assessment of the existing and proposed future traffic conditions in support of the City of Brampton's Vodden Cycling Facilities Design Feasibility Study. By way of background, the City of Brampton's 2019 Active Transportation Master plan identified the implementation of protected bike lanes or a cycle track along Vodden Street East and Howden Boulevard, and a bike lane along Hanover Street, as shown in **Figure 1-1**.

In order to accommodate new bike facilities within the current right-of-way, modifications to the existing road cross-sections, including elimination of some of the existing general-purpose lanes, are being considered. To assess the potential impacts of the proposed improvements, an intersection capacity analysis was conducted for two alternative scenarios:

- 1 Existing configurations (i.e. without dedicated bikes lanes); and
- 2 Proposed configuration with dedicated bike lanes.

A Synchro assessment was completed for both scenarios to understand the current traffic conditions along the study corridors and identify any capacity issues that may have implications on the future traffic operations when the cycling facilities are implemented.

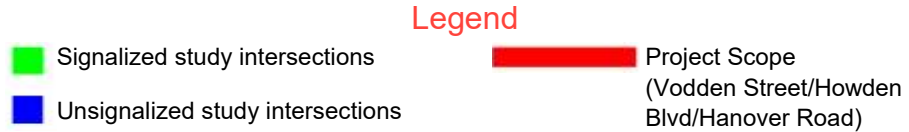
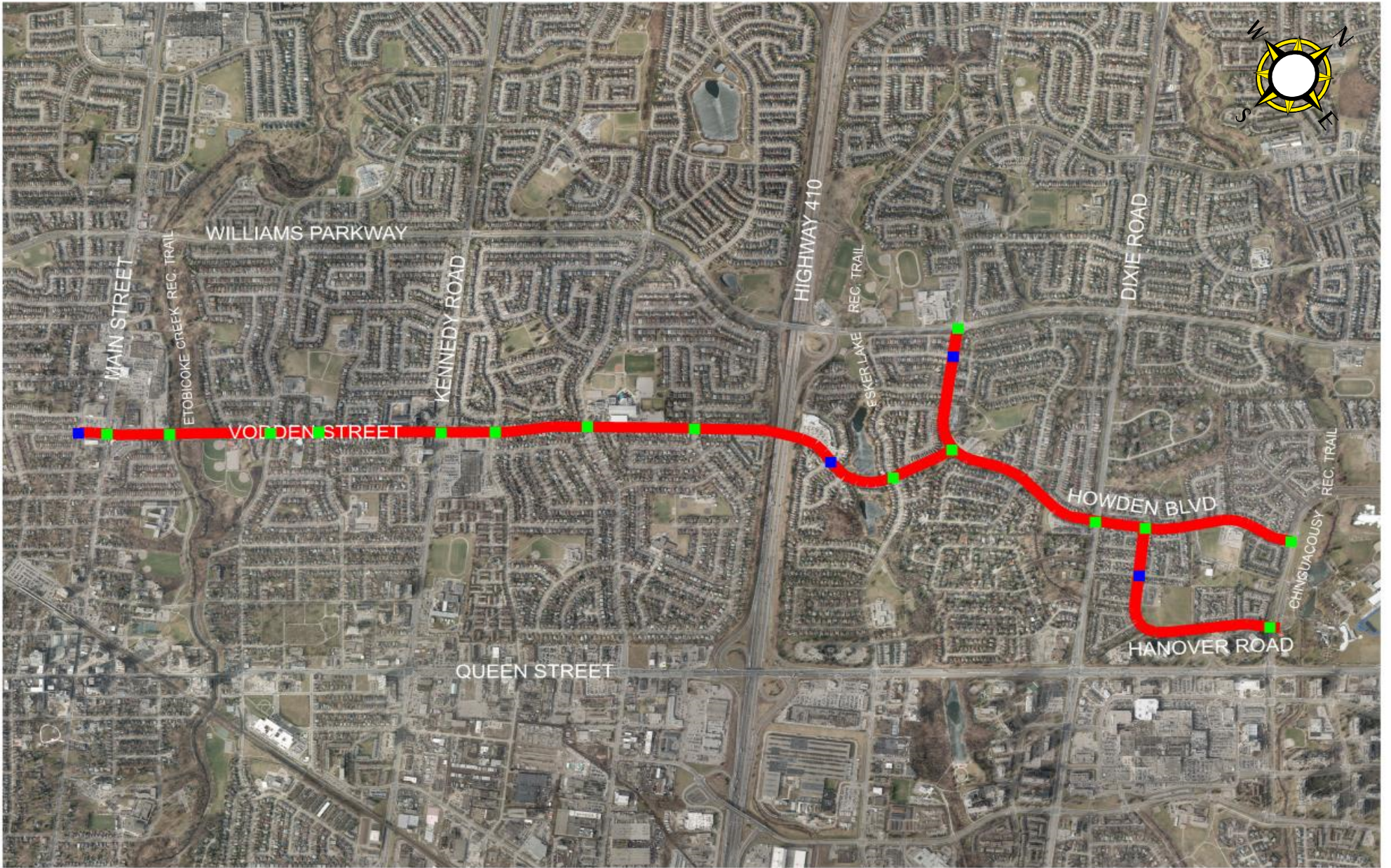


Figure 1-1

Study Area

2 EXISTING CONDITIONS

2.1 EXISTING ROAD NETWORK

The following roadways were assessed in the study:

Vodden Street between Isabella Street and Howden Boulevard is designated as a collector road with a posted speed limit of 50 km/hr. Several segments of the road have a posted speed limit of 40 km/hr due to school zones. Vodden Street has a four-lane cross-section.

Howden Boulevard between Williams Parkway and Central Park Drive is designated as a collector road with a posted speed limit of 50 km/hr. Several segments of the road have a posted speed limit of 40 km/hr due to school zones. Howden Boulevard has a four-lane cross-section.

Hanover Road between Howden Boulevard and Central Park Drive is designated as a local road with a posted speed limit of 50 km/hr. Hanover Road has a four-lane cross-section.

A total of 15 signalized and 4 unsignalized intersections are included in the study area. The lane configurations at all signalized and unsignalized intersections are illustrated in **Figure 2-1** and **Figure 2-2**.

2.2 TRAFFIC DATA

Table 2-1 summarizes the list of turning movements counts (TMCs) provided by the City. Traffic data was collected during typical weekday a.m. and p.m. peak periods. The turning movement counts used are included in **Appendix A**. The signal timing plans for the study intersections were also acquired from the City.

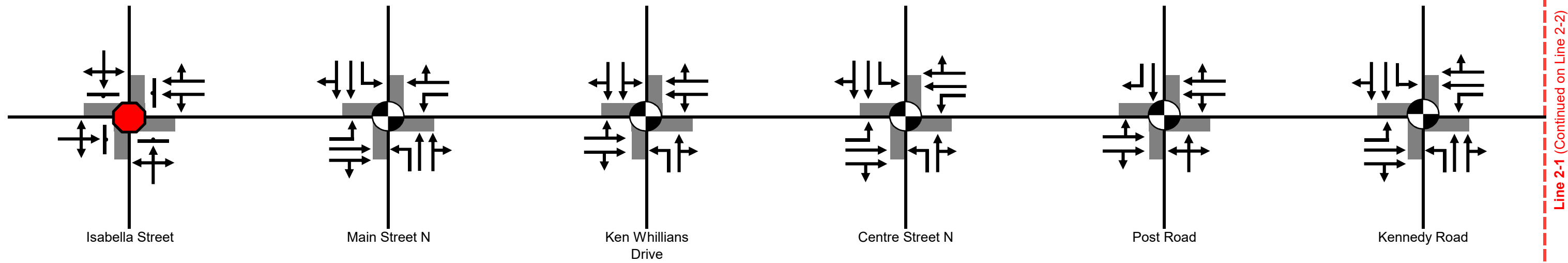
Table 2-1: Traffic Data Information

| Intersection | Traffic Control | Count Date |
|--|-----------------|-------------------------------|
| Main St N at Vodden St | Signalized | Monday, December 31, 2018 |
| Ken Whillans Dr at Vodden St E | Signalized | Wednesday, June 10, 2015 |
| Centre St N at Vodden St E | Signalized | Tuesday, December 4, 2018 |
| Post Rd at Vodden St E | Signalized | Tuesday, December 4, 2018 |
| Kennedy Rd at Vodden St E | Signalized | Wednesday, December 7, 2016 |
| Hansen Rd N at Vodden St E | Signalized | Wednesday, October 24, 2018 |
| Rutherford Rd at Vodden St | Signalized | Tuesday, February 25, 2020 |
| Archdekin Dr at Vodden St E | Signalized | Thursday, October 12, 2017 |
| Laurelcrest St - Leeward Dr at Vodden St E | Signalized | Wednesday, October 11, 2017 |
| Howden Blvd at Vodden St E | Signalized | Tuesday, June 12, 2018 |
| Howden Blvd - North Park Dr at Williams Pkwy | Signalized | Tuesday, December 4, 2018 |
| Dixie Rd at Howden Blvd | Signalized | Wednesday, October 4, 2017 |
| Hanover Rd - Highview Trl at Howden Blvd | Signalized | Wednesday, September 16, 2015 |
| Central Park Dr at Hanover Rd | Signalized | Wednesday, June 6, 2018 |
| Central Park Dr at Howden Blvd | Signalized | Tuesday, June 12, 2018 |
| Isabella St at Vodden St W | Unsignalized | Tuesday, June 16, 2020 |
| Lakeridge Dr at Vodden St E | Unsignalized | Wednesday, October 31, 2018 |
| Howden Blvd at Leander St | Unsignalized | Thursday, December 15, 2016 |
| Hanover Rd at Homeland Crt - Huntington Crt | Unsignalized | Thursday, September 13, 2018 |

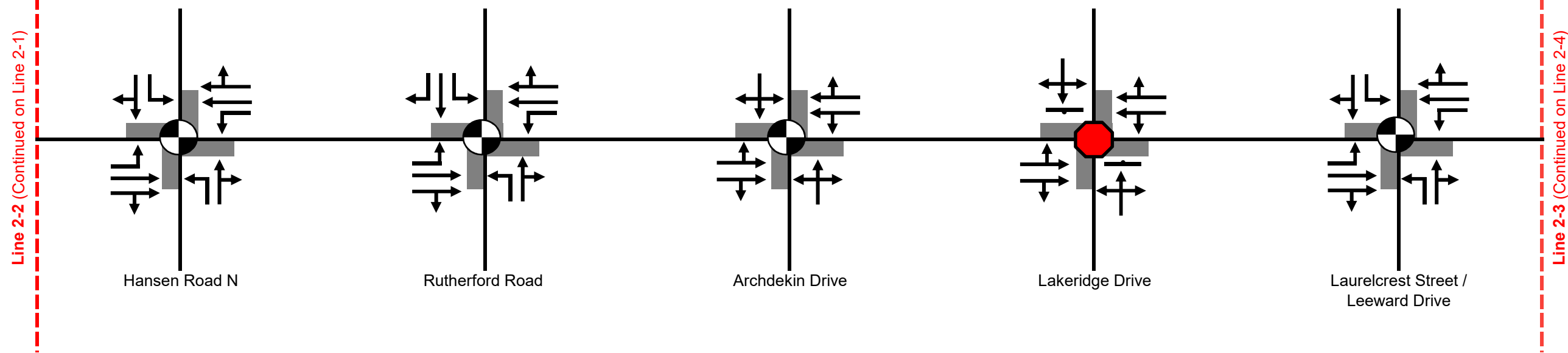
The weekday a.m. and p.m. peak hour volumes at the study intersections are illustrated in **Figure 2-3** and **Figure 2-4**.



Vodden Street E



Vodden Street E



Legend


-  Signalized Intersection
-  Unsignalized Intersection

Figure 2-1
Existing Road Configuration
(Vodden Street)

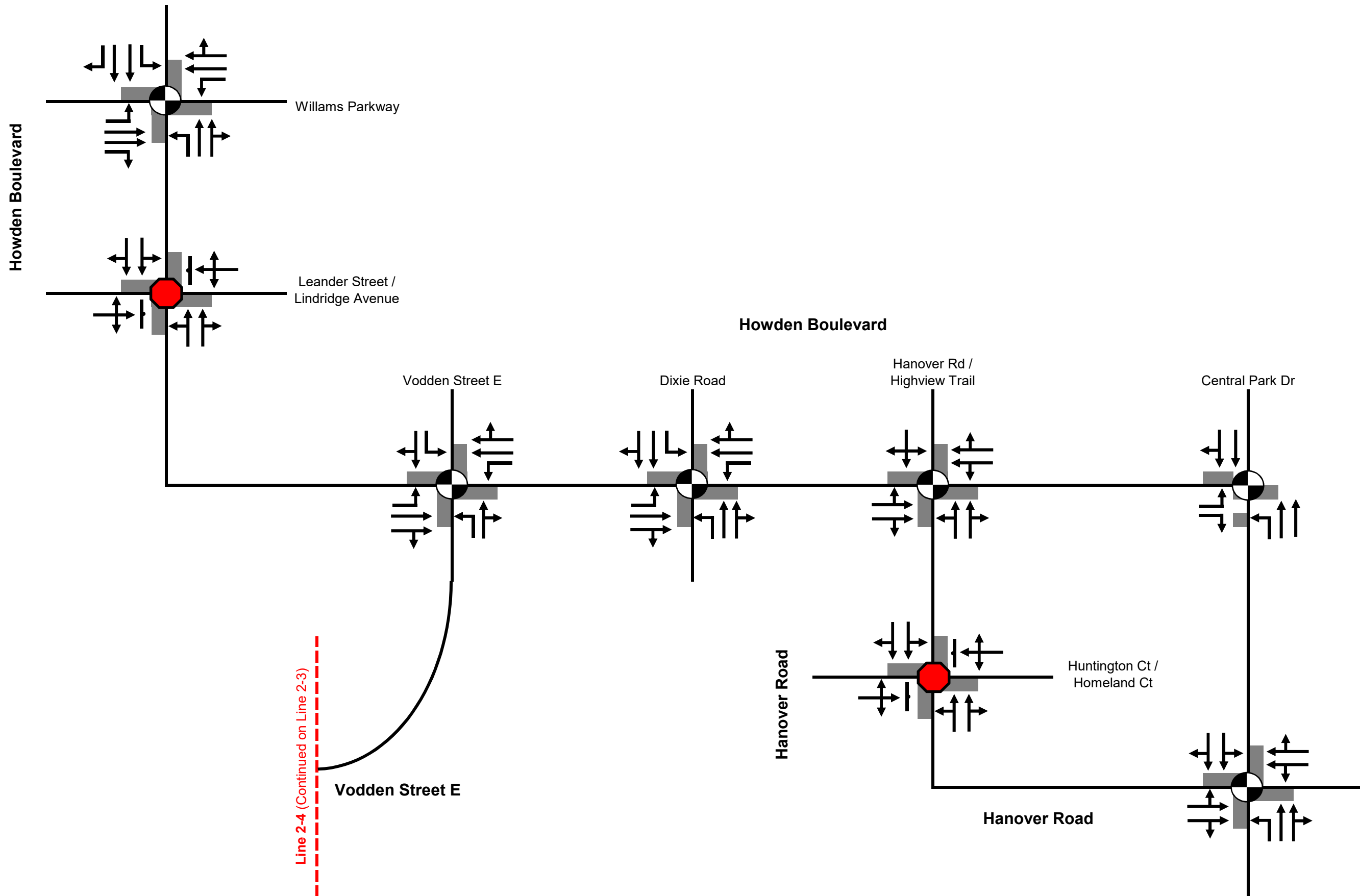
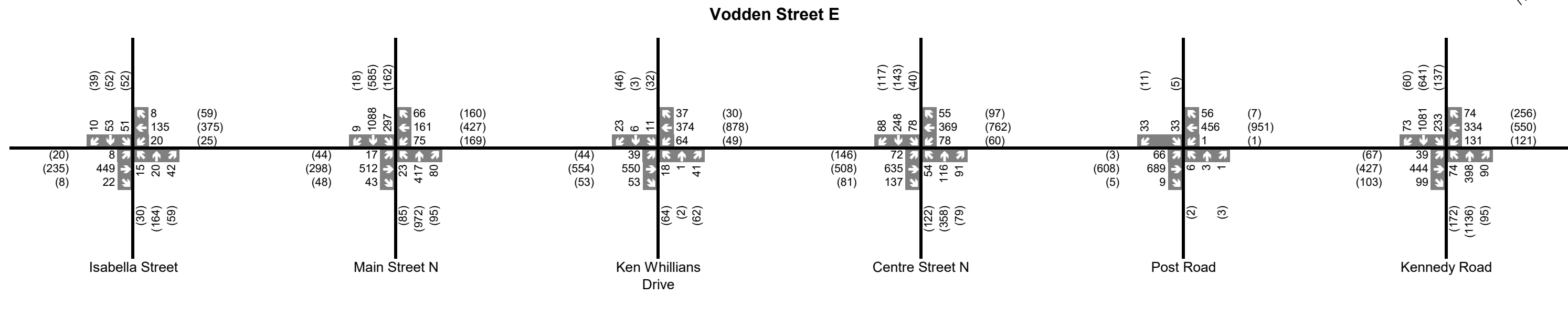
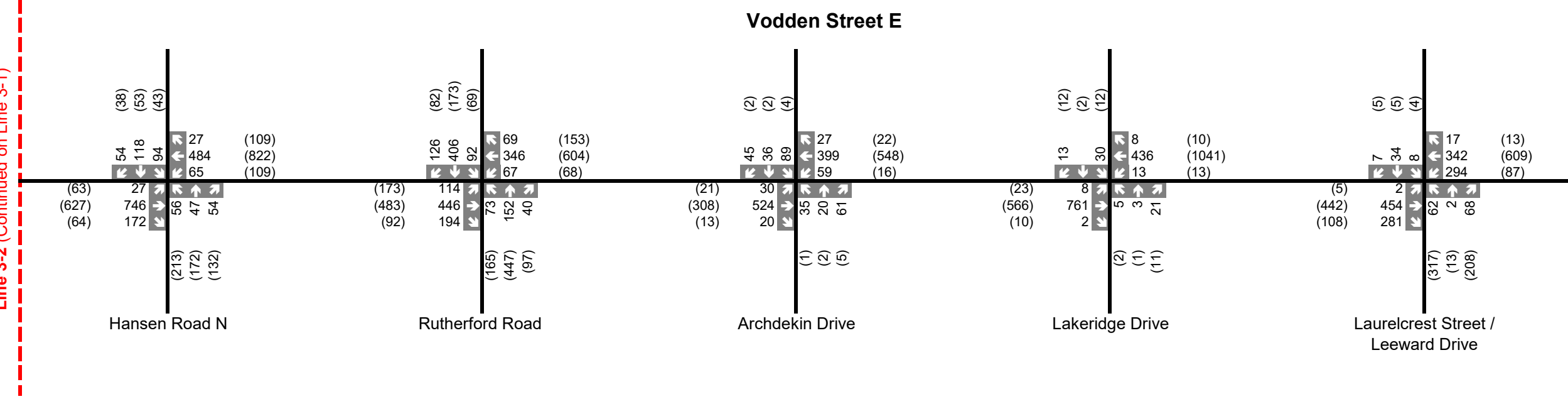


Figure 2-2
Existing Road Configuration
(Howden Blvd / Hanover Rd)



Line 3-2 (Continued on Line 3-1)



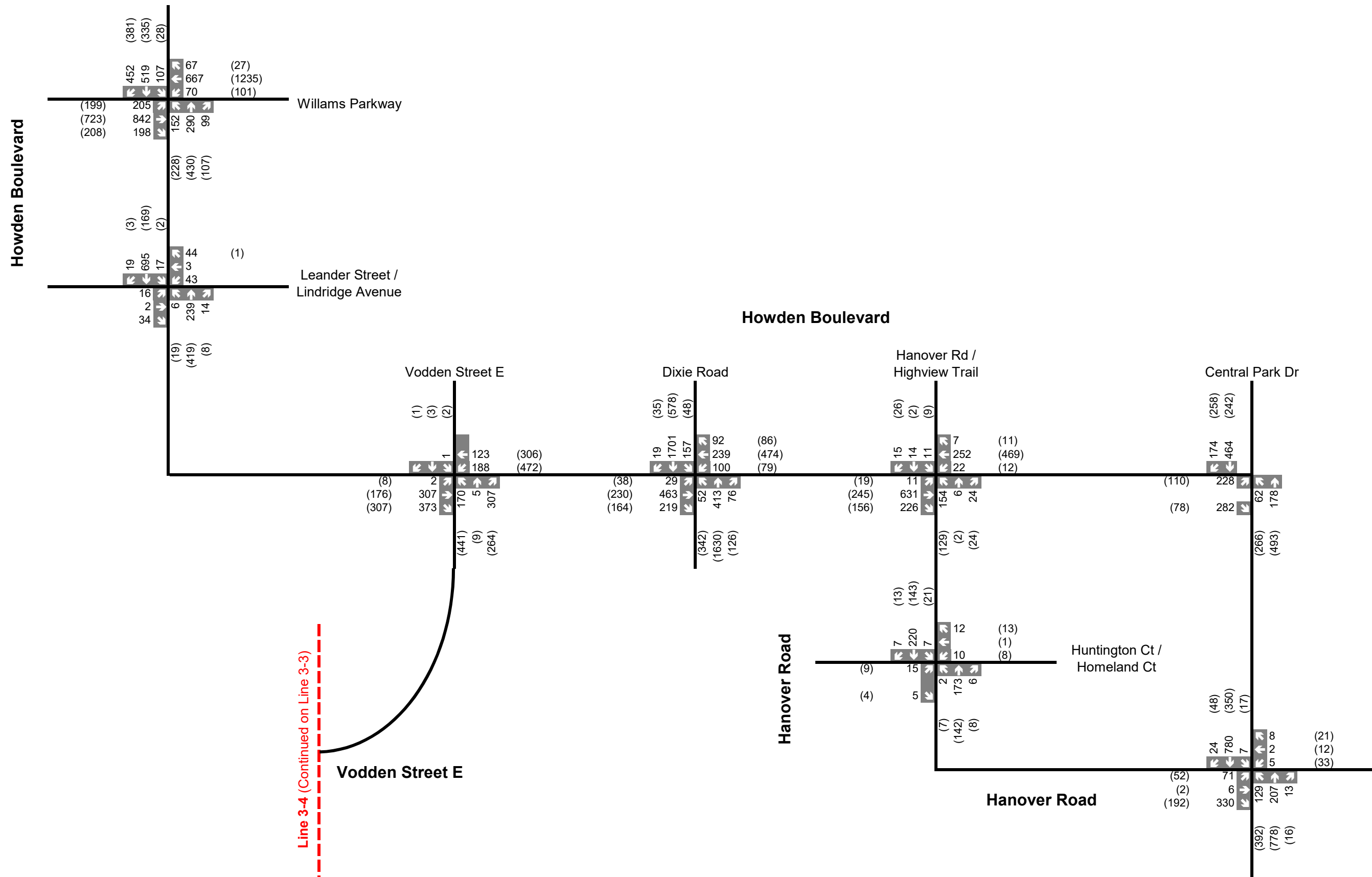
Line 3-3 (Continued on Line 3-4)



Legend

xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes

Figure 2-3
Existing Volumes
(Vodden Street)



Legend

xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes

Figure 2-4
Existing Volumes
(Howden Blvd / Hanover Rd)

2.3 EXISTING TRAFFIC CONDITIONS

To analyze existing traffic conditions in the study area, capacity analyses were undertaken using the Synchro 10 traffic analysis software. This software incorporates the methodology outlined in the Highway Capacity Manual (HCM), Transportation Research Board, 2000 and 2010.

MODEL DEVELOPMENT AND ASSUMPTIONS

The Synchro model has been established based on the City of Brampton's Transportation Impact and Parking Study terms of Reference document (2018) and the Region of Peel's Synchro Guidelines (2010). The following parameters and assumptions were initially applied in the Synchro model:

- The bus blockage parameter has been applied on lane segments with a bus stop to account for the presence Brampton Transit bus services.
- The pedestrian and heavy vehicle parameters are based on the traffic counts.
- A lost time adjustment of 0 was initially applied at all of the signalized intersections.
- Where detailed 15 minutes turning movement counts were not provided, the Synchro default peak hour factor (PHF) of 0.92 was assumed. The Region of Peel's Synchro Guidelines (2010) stipulate that a PHF of 1.0 shall be used for all movements. However, it was deemed more appropriate to use a PHF of 0.92 for this type of roads and environment, and this represents a conservative approach.
- As per the Region of Peel's Synchro Guidelines (2010), exclusive turning lanes were coded with a lane width of 3.5 metres. The widths of all other lanes were set the Synchro default of 3.7 metres. The lane width parameters in the model are to be updated when a detailed design is available.

INTERSECTION CAPACITY ANALYSIS

An intersection capacity analysis provides an indication of traffic operations based on calculations of volume-to-capacity (v/c) and delays for individual movements at an intersection. Traffic operations were analyzed at the study intersections to determine the existing LOS during the weekday a.m. and p.m. peak hours.

The results of the intersection capacity analysis under the existing conditions with the above input parameters are summarized in **Table 2-2**. Detailed intersection capacity analysis sheets are included in **Appendix B**. It is important to note these are uncalibrated Synchro models based on the traffic data received from the City. The results for the critical intersection will be carefully reviewed and calibrated when deemed necessary and when the additional data from the City is available.

The results presented in **Table 2-2** indicates that all study intersections currently operate at acceptable LOS with no critical movements, with the exception of the following:

- **Howden Boulevard / N Park Drive & Willams Parkway**
The northbound left movement is shown to operate marginally over capacity at a v/c of 1.01 in the p.m. peak hour. Note that a default PHF of 0.92 was assumed at this intersection as detailed 15-minute TMCs were not available. This intersection operates with a cycle length of 160 seconds, and the current capacity issues could be addressed by optimizing the traffic signal phasing plans.

– **Vodden Street East & Howden Boulevard**

The northbound left turn movement at the intersection is shown to operate significantly over capacity in both the a.m. and p.m. peak hours at v/c ratios of 1.77 and 4.55 respectively. As indicated above, this is theoretically impossible. As per the signal timing plans provided by the City, a split traffic phasing plan is used for the northbound and southbound movements. The north leg serves as a Church driveway, and it experiences very low traffic demands during the a.m. and p.m. peak volumes. It is likely that this phase is frequently skipped, and that Synchro does not accurately reflect this condition. However, by removing the split phase and optimizing the signal timings, all intersection movements operate well under capacity. As a result, a review of the signal timing plan and a site visit is required to calibrate this intersection.

Table 2-2: Weekday Existing Intersection Operations

| Intersection | Weekday A.M. Peak Hour | | Weekday P.M. Peak Hour | |
|--|--------------------------------|---|--------------------------------|---|
| | Overall LOS (Delay in Seconds) | Critical Movement (Volume/Capacity Ratio) | Overall LOS (Delay in Seconds) | Critical Movement (Volume/Capacity Ratio) |
| Signalized Intersections | | | | |
| Archdekin Drive & Vodden Street East | B (13) | | A (2) | |
| Central Park Drive & Hanover Road | B (13) | | B (14) | NBL (0.91) |
| Central Park Drive & Howden Blvd | B (12) | | A (8) | |
| Centre Street North & Vodden Street East | B (13) | | C (21) | NB-TR (0.95) (E) |
| Dixie Road & Howden Blvd | D (43) | SBTR (0.95) (D) EBT (0.94) (E) | C (27) | |
| Hanover Road/Highview Trail & Howden Blvd | A (9) | | A (8) | |
| Hansen Road North & Vodden Street East | B (12) | | B (16) | |
| Howden Blvd/N Park Drive & Willams Parkway | D (37) | | D (43) | NBL (1.02) (F) |
| Ken Whillans Drive/Private Access & Vodden Street East | A (5) | | B (11) | |
| Kennedy Road North & Vodden Street East | C (33) | | D (36) | NBL (0.93) (F) |
| Laurelcrest Street/Leeward Drive & Vodden Street East | B (17) | | C (30) | |
| Main Street & Vodden Street West/Vodden Street East | C (30) | WBL (1.00) (F) | D (42) | WBT (0.93) (E) |
| Post Road/School Access & Vodden Street East | A (4) | | A (2) | |
| Rutherford Road North & Vodden Street East | C (20) | | C (24) | NBT (0.89) (D) |
| Vodden Street East & Howden Blvd | E (66) | NBL (1.77) (F) | F (389) | NBL (4.55) (F) WBL (0.99) (E) |
| Unsignalized Intersections | | | | |
| Hanover Road & Homeland Ct/Huntington Ct | EB-TLR (12) | | EB-TLR (11) | |
| Howden Blvd & Lindridge Avenue/Leander Street | EB-TLR (13) | | WB-TLR (10) | |
| Isabella Street & Vodden Street West | EB-TLR (19) | | EB-TLR (16) | |
| Lansdowne Drive/Lakeridge Drive & Vodden Street East | SB-TLR (23) | | SB-TLR (32) | |

1. For signalized intersections, the level of service is based on the overall delay of the intersection. For unsignalized intersections, the level of service is based on the movement with the highest delay.

2. Critical v/c ratios are only listed for values over 0.90.

QUEUING ANALYSIS

A queuing analysis using Synchro 10 was completed under existing conditions, with 95th and 50th percentile queue length presented in **Table 2-3**. Note, only cases where 95th and 50th percentile queues exceed the available storage lengths are presented. Detailed queue results for all intersections and individual movements are provided in **Appendix B**.

Table 2-3: Weekday Existing Intersection Queue Lengths

| Intersection | Available Storage (m) | 95 th Percentile Queues (m) [50 th Percentile Queues (m)] | |
|--|-----------------------|--|--------------|
| | | AM Peak Hour | PM Peak hour |
| Central Park Drive & Hanover Road | | | |
| Northbound Left | 45 | 45 [11] | 81 [25] |
| Dixie Road & Howden Blvd | | | |
| Southbound Left | 40 | 44 [26] | |
| Hansen Road North & Vodden Street East | | | |
| Northbound Left | 35 | | 55 [35] |
| Southbound Left | 24 | 28 [16] | |
| Howden Blvd/N Park Drive & Willams Parkway | | | |
| Eastbound Right | 20 | 39 [23] | 29 [14] |
| Northbound Left | 53 | | 103 [63] |
| Southbound Right | 22 | 155 [90] | 117 [78] |
| Kennedy Road North & Vodden Street East | | | |
| Westbound Left | 44 | 46 [28] | |
| Northbound Through | 130 | | 163 [137] |
| Laurelcrest Street/Leeward Drive & Vodden Street East | | | |
| Westbound Left | 43 | 106 [47] | 44 [17] |
| Northbound Left | 43 | | 49 [31] |
| Southbound Left | 23 | 59 [33] | |
| Main Street & Vodden Street West/Vodden Street East | | | |
| Eastbound Through | 99 | 104 [94] | |
| Westbound Through | 229 | | 259 [186] |
| Southbound Left | 23 | 61 [33] | 58 [28] |
| Vodden Street East & Howden Blvd | | | |
| Westbound Left | 26 | 29 [11] | 123 [33] |
| Northbound Left | 104 | | 178 [96] |

The queuing analysis for existing conditions indicates that majority of the 95th percentile queues are expected to be accommodated within the available storage lengths. It should be noted that the 95th percentile queue lengths are typically reached only a few times during peak periods; therefore, the impact of the queues would be limited as long as the 50th percentile queue lengths are within the available storage lengths. For movements where the 95th percentile queues exceed the storage lengths, the 50th percentile queues could readily be accommodated.

However, as shown in **Table 2-3** there currently exists several exclusive turning movements where the 50th percentile queues exceed the storage lengths in the peak hours. Majority of these 50th percentile queues only marginally exceed the available storage lengths, however additional review and calibration is required at the following intersections:

— **Southbound right turn lane at Howden Boulevard/N Park Drive & Williams Parkway**

As shown in **Table 2-3**, the current southbound right turn lane storage length is approximately 22 meters, while the average queues are expected to be 90 meters and 78 meters in the a.m. and p.m. peak hours respectively. Note that approximately 400 and 450 vehicles are making the southbound right turn in the a.m. and p.m. peak hours respectively, as per the TMCs.

— **Westbound left turn lane at Vodden Street East & Howden Boulevard**

As discussed, additional review of the TMCs and signal timing plans is required for the intersection of and Vodden Street East & Howden Blvd.

3 FUTURE CONDITIONS

3.1 PROPOSED FUTURE ROAD NETWORK

To accommodate the dedicated bike lanes, the changes to the road cross-sections have been proposed, as follows:

1 Vodden Street

- a Conversion of all through-left lanes on Vodden Street to exclusive left turn lanes.
- b Removal of an eastbound through lane and a westbound through lane at Centre Street North, Hansen Road North, and Laurelcrest Street / Leeward Drive.
- c Conversion of eastbound through-right lanes and westbound through-right lanes to exclusive right-turn lanes at Kennedy Road North, and Rutherford Road North.

2 Howden Boulevard

- a Conversion of all through-left lanes on Howden Boulevard to exclusive left turn lanes.
- b Removal of a northbound through and southbound through lane at Williams Parkway.
- c Removal of an eastbound through lane and a westbound through lane at Vodden Street E.

3 Hanover Road

- a Conversion of all through-left lanes on Hanover Road to exclusive left turn lanes.

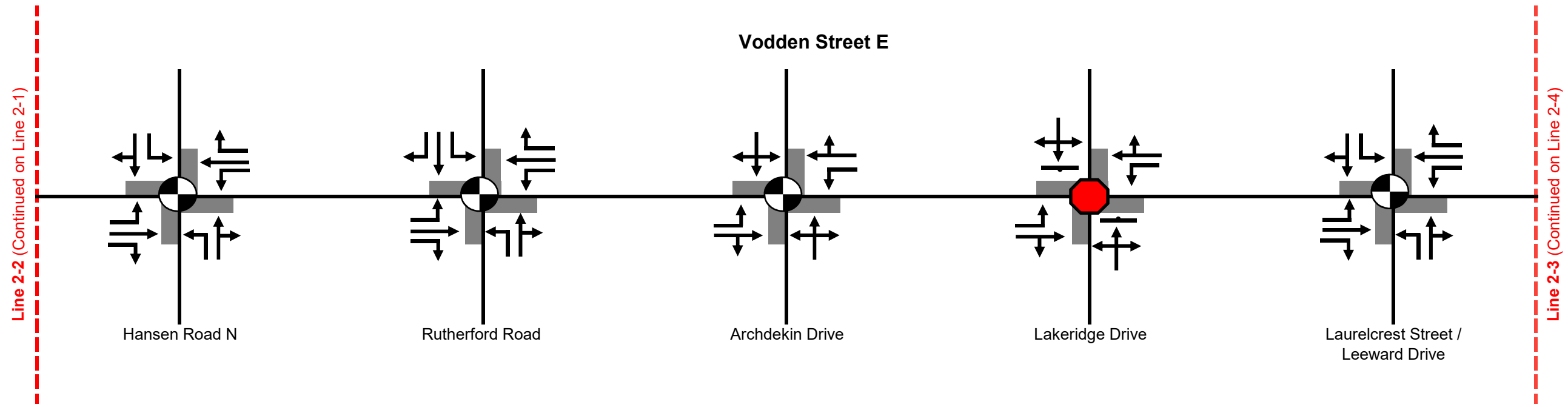
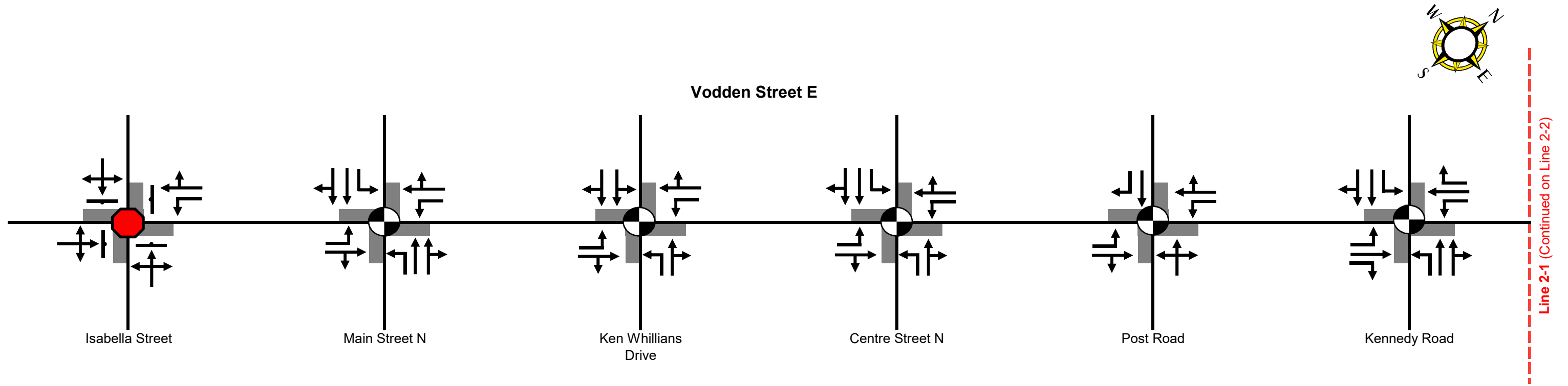
The proposed lane configurations at the study intersections are illustrated in **Figure 3-1** and **Figure 3-2**.

Note that the storage lengths of reconfigured turning lanes were estimated in the model and are to be determined during the detailed road design process.

3.2 FUTURE TRAFFIC VOLUMES

The existing turning movements counts (TMCs) provided by the City were used in the future conditions analysis. This approach was taken to determine whether the proposed future road network can accommodate the existing traffic demand. It has been assumed that there will not be any changes to the existing traffic volumes along the study corridors (no traffic growth nor traffic reduction). The weekday a.m. and p.m. peak hour volumes at the study intersections are illustrated in **Figure 2-3** and **Figure 2-4**.

As identified in the **Section 2.3**, the TMC at Rutherford Road North and Vodden Street East will need to be reviewed. Based on the TMC provided, several intersection movements are operating over capacity under existing conditions, which is theoretically impossible since supply volumes (i.e. only vehicles that cleared the intersection were recorded) were used in the analysis.



Legend

- 

Signalized Intersection
- 

Unsignalized Intersection



Figure 3-1
Proposed Future Road Configuration
(Vodden Street)

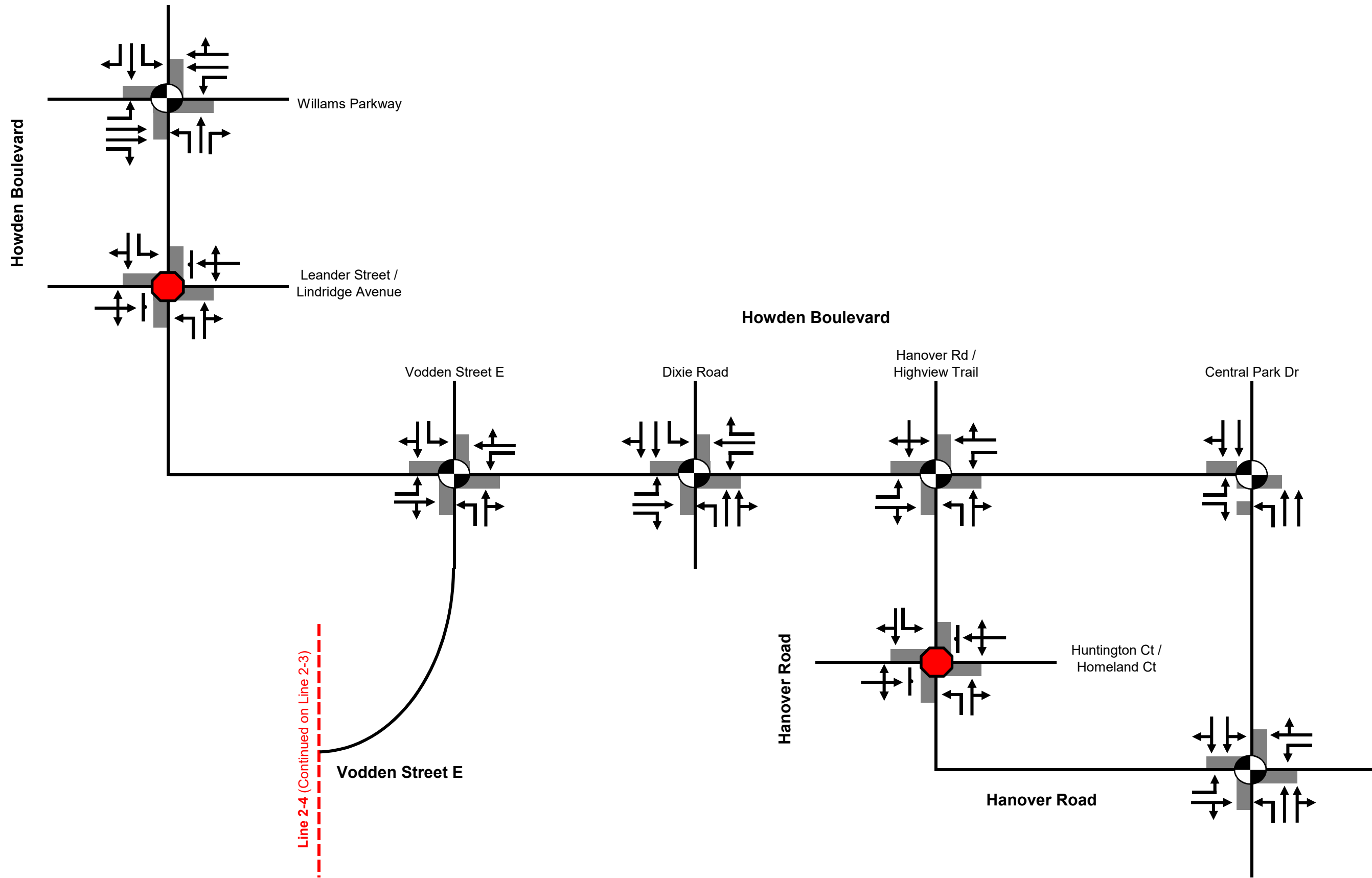


Figure 3-2
Proposed Future Road Configuration
(Howden Blvd / Hanover Rd)

3.3 FUTURE TRAFFIC CONDITIONS

MODEL DEVELOPMENT AND ASSUMPTIONS

The existing conditions Synchro model was used as the base model of the future conditions analysis. The lane configurations were modified as per the proposed road network shown in **Figure 3-1** and **Figure 3-2**. It is important to note these are uncalibrated Synchro models based on the traffic data received from the City. The results for the critical intersection will be carefully reviewed and calibrated when deemed necessary.

Existing signal timings were maintained except at the following intersections that needed signal timing optimization to address capacity issues resulting from the proposed lane configuration:

- **Main Street & Vodden Street** (a.m. peak hour)
- **Kennedy Road North & Vodden Street East** (a.m. & p.m. peak hours)
- **Laurelcrest Street/Leeward Drive & Vodden Street East** (a.m. & p.m. peak hours)
 - Protected permissive westbound left turn phase added in the a.m. peak hour signal timing plan.
- **Vodden Street East & Howden Boulevard** (a.m. & p.m. peak hours)
 - The north-south split phase was replaced with overlapping phases to improve intersection operations.
- **Dixie Road & Howden Blvd** (a.m. peak hour)
- **Rutherford Road North & Vodden Street East** (a.m. & p.m. peak hours)
- **Howden Blvd & Williams Parkway** (a.m. & p.m. peak hours)

INTERSECTION CAPACITY ANALYSIS

The results of the intersection capacity analysis under future conditions are summarized in **Table 3-1**. Detailed intersection capacity analysis sheets are included in **Appendix C**. The results presented in **Table 3-1** indicates that all study intersections operate at acceptable LOS with no critical movements, with the exception of the following:

- **Dixie Road & Howden Blvd (Signalized)**

The southbound through movement is shown to operate at capacity at a v/c of 1.00 in the a.m. peak hour. Note that a default PHF of 0.92 was assumed at this intersection as detailed 15-minute TMCs were not available. It is likely that the PHF at the intersection is greater than 0.92 and thus the Synchro results may be reportedly worse than reality. Should the intersection approach capacity, it is anticipated that some drivers will change their travel patterns to avoid the peak period. This spreads demand more evenly over the peak hour (i.e. higher PHF). Anyway, consideration should be given to maintain the existing lane configurations on Howden Boulevard which would address these capacity issues.
- **Lansdowne Drive/Lakeridge Drive & Vodden Street East (Unsignalized)**

In the p.m. peak hour the southbound and northbound stop-controlled approaches along Lansdowne Drive and Lakeridge Drive experiences significant delays at 305 seconds and 59 seconds respectively. The through lane reductions along Vodden Street results in fewer gaps for the vehicles stopped at the minor approaches to clear the intersection. It is recommended traffic signalization of this intersection to be considered in the next steps of the study.

Table 3-1: Weekday Future Intersection Operations

| Intersection | Weekday A.M. Peak Hour | | Weekday P.M. Peak Hour | |
|--|--------------------------------|---|--------------------------------|---|
| | Overall LOS (Delay in Seconds) | Critical Movement (Volume/Capacity Ratio) | Overall LOS (Delay in Seconds) | Critical Movement (Volume/Capacity Ratio) |
| Signalized Intersections | | | | |
| Archdekin Drive & Vodden Street East | B (13) | | A (3) | |
| Central Park Drive & Hanover Road | B (16) | | B (12) | |
| Central Park Drive & Howden Blvd | B (12) | | A (8) | |
| Centre Street North & Vodden Street East | B (16) | | D (38) | WBT (0.99) NBT (0.99) |
| Dixie Road & Howden Blvd | D (51) | EBT (0.99) SBT (1.00) | C (33) | WBT (0.91) |
| Hanover Road/Highview Trail & Howden Blvd | B (17) | | B (10) | |
| Hansen Road North & Vodden Street East | B (13) | | B (19) | |
| Howden Blvd/N Park Drive & Williams Parkway | D (43) | | D (49) | EBL (0.94) NBL (0.98) |
| Ken Whillans Drive/Private Access & Vodden Street East | A (6) | | A (8) | |
| Kennedy Road North & Vodden Street East | D (38) | | D (41) | |
| Laurelcrest Street/Leeward Drive & Vodden Street East | B (16) | | C (23) | |
| Main Street & Vodden Street West/Vodden Street East | D (37) | WBL (0.90) | D (43) | WBT (0.93) |
| Post Road/School Access & Vodden Street East | A (8) | | A (4) | |
| Rutherford Road North & Vodden Street East | B (19) | | C (24) | |
| Vodden Street East & Howden Blvd | C (22) | | D (47) | EBT (0.90) WBL (0.97) NBL (0.95) |
| Unsignalized Intersections | | | | |
| Hanover Road & Homeland Ct/Huntington Ct | EBTLR (13) | | EBTLR (12) | |
| Howden Blvd & Lindridge Avenue/Leander Street | WBTLR (29) | | WBTLR (11) | |
| Isabella Street & Vodden Street West | EBTLR (20) | | WBTR (34) | |
| Lansdowne Drive/Lakeridge Drive & Vodden Street East | SBTLR (44) | | SBTLR (305) NBTLR (59) | |

1. For signalized intersections, the level of service is based on the overall delay of the intersection. For unsignalized intersections, the level of service is based on the movement with the highest delay.
2. Critical v/c ratios are only listed for values over 0.90.

QUEUING ANALYSIS

A queuing analysis using Synchro 10 was completed under existing conditions, with 95th and 50th percentile queue length presented in **Table 3-2**. Note, only queues where 95th percentile queues exceed the available storage lengths are presented. Detailed queue results for all intersections and individual movements are provided in **Appendix C**.

Table 3-2: Weekday Future Intersection Queue Lengths

| Intersection | Available Storage (m) | 95 th Percentile Queues (m) [50 th Percentile Queues (m)] | |
|--|-----------------------|--|--------------|
| | | AM Peak Hour | PM Peak hour |
| Central Park Drive & Hanover Road | | | |
| Northbound Left | 45 | 45 [11] | 83 [26] |
| Centre Street North & Vodden Street East | | | |
| Westbound Through | 167 | | 239 [151] |
| Dixie Road & Howden Blvd | | | |
| Eastbound Right | 53 | 62 [36] | |
| Southbound Left | 40 | 46 [28] | |
| Hanover Road/Highview Trail & Howden Blvd | | | |
| Eastbound Through | 188 | 189 [82] | |
| Hansen Road North & Vodden Street East | | | |
| Northbound Left | 35 | | 57 [35] |
| Southbound Left | 24 | 28 [16] | |
| Howden Blvd/N Park Drive & Willams Parkway | | | |
| Eastbound Right | 20 | 52 [30] | 35 [19] |
| Northbound Left | 53 | | 100 [55] |
| Southbound Right | 22 | 162 [111] | 141 [89] |
| Kennedy Road North & Vodden Street East | | | |
| Westbound Left | 44 | 49 [24] | |
| Westbound Right | 44 | | 49 [27] |
| Northbound Through | 130 | | 194 [158] |
| Laurelcrest Street/Leeward Drive & Vodden Street East | | | |
| Northbound Left | 43 | | 82 [52] |
| Main Street & Vodden Street West/Vodden Street East | | | |
| Eastbound Through | 99 | 200 [172] | 121 [89] |
| Westbound Through | 229 | | 259 [186] |
| Southbound Left | 23 | 88 [55] | 55 [28] |
| Rutherford Road North & Vodden Street East | | | |
| Eastbound Left | 50 | | 54 [25] |
| Vodden Street East & Howden Blvd | | | |
| Westbound Left | 26 | | 128 [68] |

The queuing analysis for future conditions indicates that majority of the 95th percentile queues are expected to be accommodated within the available storage lengths. It should be noted that the 95th percentile queue lengths are typically reached only a few times during peak periods; therefore, the impact of the queues would be limited as long as the 50th percentile queue lengths are within the available storage lengths. For movements where the 95th percentile queues exceed the storage lengths, the average queues could readily be accommodated.

The future conditions queuing analysis results are similar to that of existing conditions. As shown in **Table 2-3** there are several exclusive turning movements where the 50th percentile queues exceed the storage lengths in the peak

hours. Majority of these 50th percentile queues only marginally exceed the available storage lengths, however additional review and calibration is required at the following intersections where the 50th percentile queues significantly exceed the available storage:

- **Southbound right turn lane at Howden Blvd/N Park Drive & Williams Parkway**

As shown in **Table 3**, the current southbound right turn lane storage length is approximately 22 meters, while the average queues are expected to be 111 meters and 89 meters in the a.m. and p.m. peak hours respectively. Note that approximately 400 and 450 vehicles are making the southbound right turn in the a.m. and p.m. peak hours respectively, as per the TMCs. Even in existing conditions, the southbound right queues significantly exceed the available storage. During the detailed design process of the intersection, an extension of the southbound right lane should be considered.

- **Westbound left turn lane at Vodden Street & Howden Blvd in the p.m. peak hour**

As shown in **Table 3**, the current westbound left turn lane storage length is approximately 26 meters, while the average queue is expected to be 68 meters in the p.m. peak hour. Compared to existing conditions, where the average expected queue was 33 meters, it is evident that the lane reductions on Howden Blvd is causing longer queues at that turn. Note that approximately 475 vehicles are making the westbound left turn in the p.m. peak hour, as per the TMCs. During the detailed design process of the intersection, an extension of the westbound left turn lane should be considered.

4 CONCLUSIONS

Based on the analysis contained in this report, our conclusions are as follows:

- Majority of the study intersections currently operate within acceptable LOS with no critical movements. However, site visits and further review of TMCs and signal timing plans are required, particularly at the intersection of and Vodden Street East & Howden Blvd, for model calibration.
- Under the future conditions, majority of the study intersections are expected to operate within acceptable LOS with no critical movements.
- It is recommended to consider signalization of the intersections of Lansdowne Drive / Lakeridge Drive & Vodden Street due to capacity constraints and high delays experienced by the side street traffic.
- The consideration should be given to maintain the existing lane configurations at the intersection Dixie Road and Howden Boulevard due to the intersection capacity constraints.
- Storage lane extensions may need to be considered for the southbound right turn lane at Howden Blvd/N Park Drive and the westbound left turn lane at Vodden Street & Howden Blvd during the detailed design stages of the project.

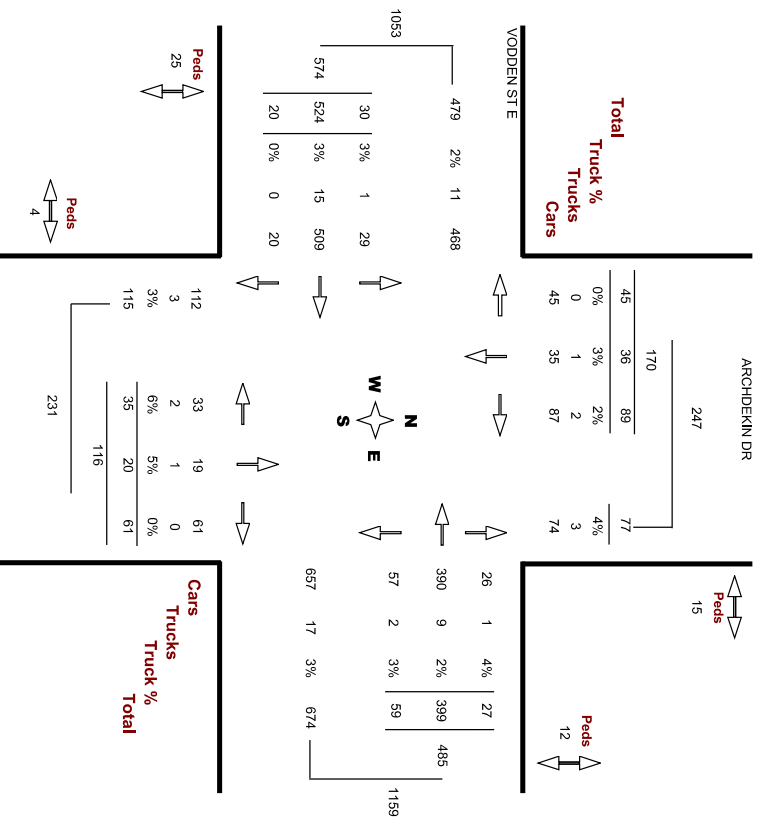
APPENDIX

A TURNING MOVEMENT COUNTS



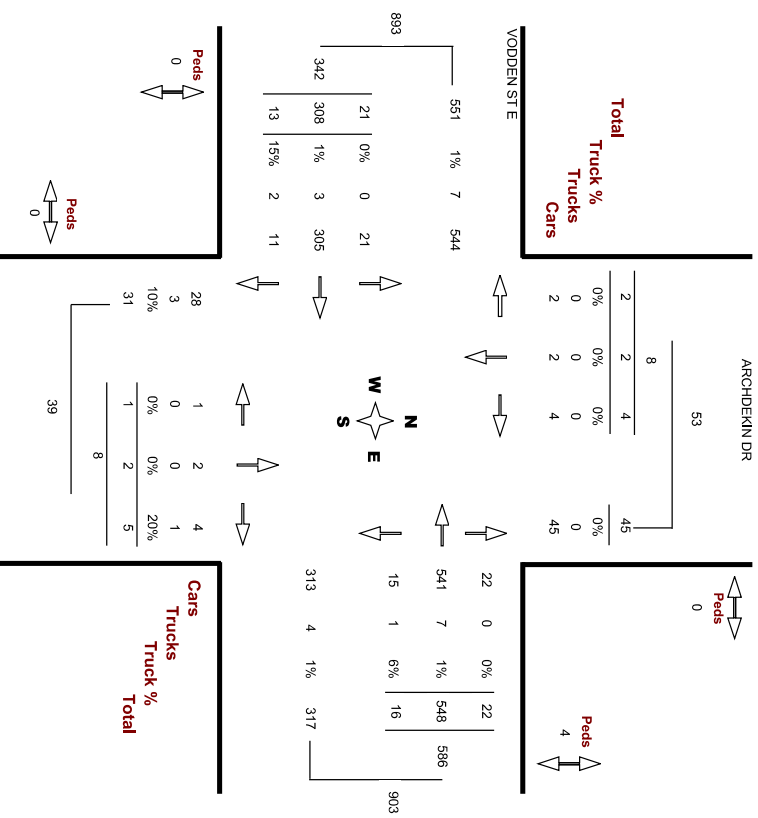
Turning Movements Report - AM Period

Location:..... ARCHDEKIN DR @ VODDEN ST E GeolD..... 975
 Municipality: Brampton Count Date: Thursday, 12 October, 2017
 Traffic Cont: Traffic signal Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... None Peak Hour:.. 07:45 AM — 08:45 AM



Turning Movements Report - PM Period

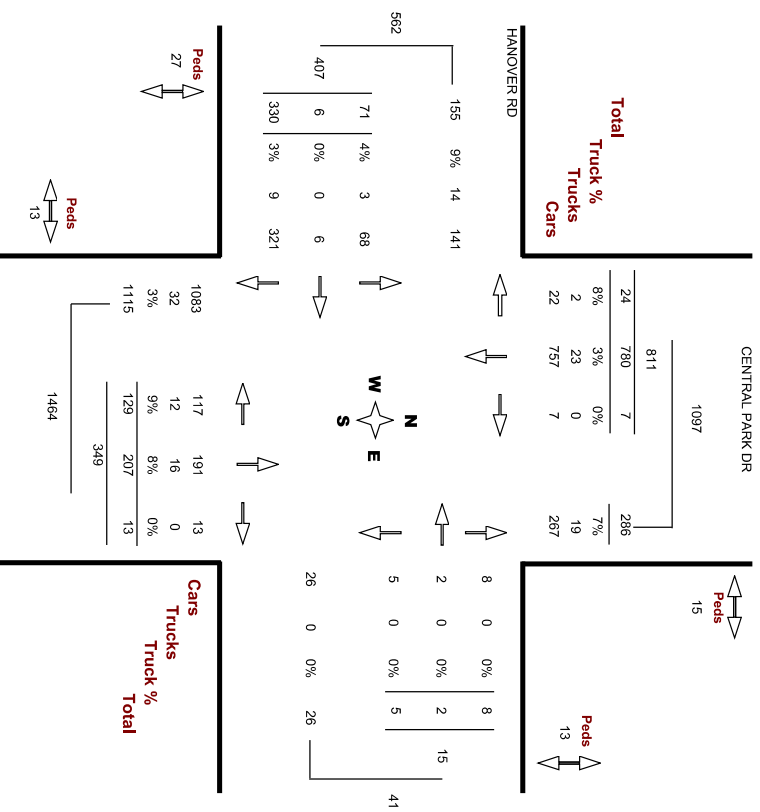
Location:..... ARCHDEKIN DR @ VODDEN ST E GeolD..... 975
 Municipality: Brampton Count Date: Thursday, 12 October, 2017
 Traffic Cont: Traffic signal Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... None Peak Hour:.. 05:00 PM — 06:00 PM





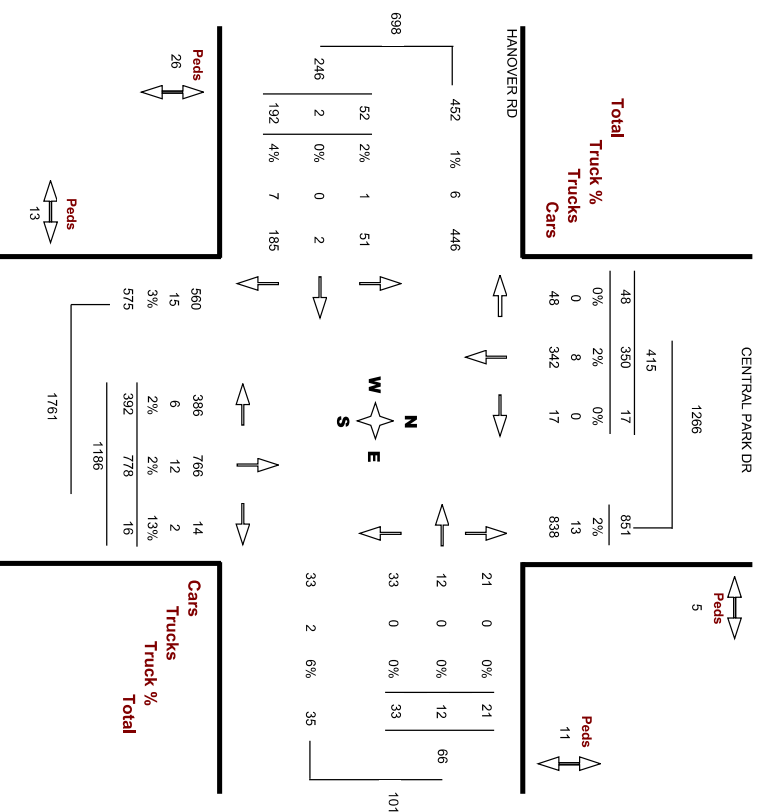
Turning Movements Report - AM Period

Location..... CENTRAL PARK DR @ HANOVER RD GeolD..... 2706
 Municipality.. Brampton Count Date. Wednesday, 06 June, 2018
 Traffic Cont. Traffic signal Count Time. 07:00 AM — 09:00 AM
 Major Dir..... None Peak Hour.. 07:30 AM — 08:30 AM



Turning Movements Report - PM Period

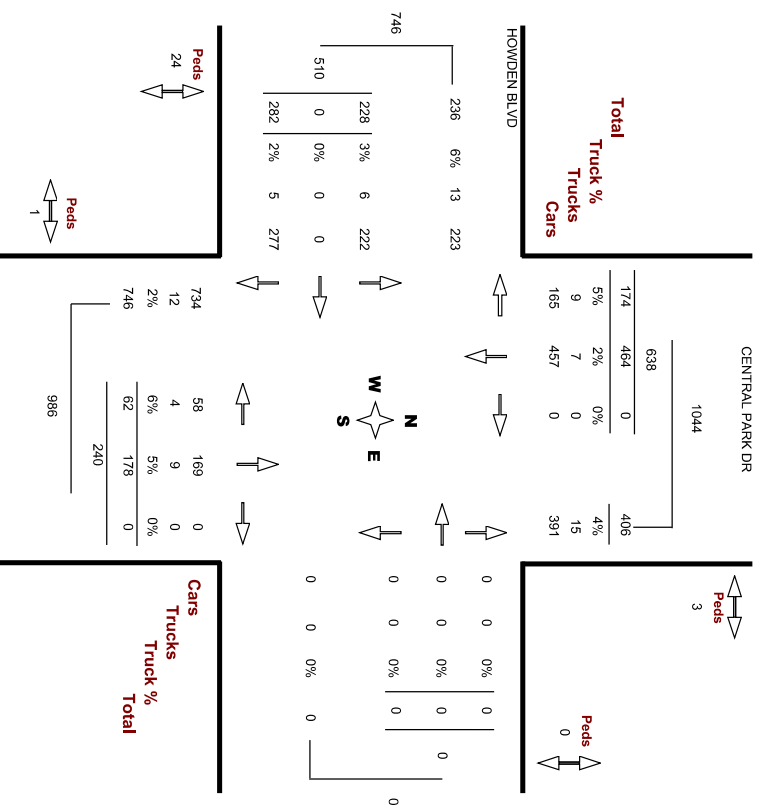
Location..... CENTRAL PARK DR @ HANOVER RD GeolD..... 2706
 Municipality.. Brampton Count Date. Wednesday, 06 June, 2018
 Traffic Cont. Traffic signal Count Time. 03:00 PM — 06:00 PM
 Major Dir..... None Peak Hour.. 04:45 PM — 05:45 PM





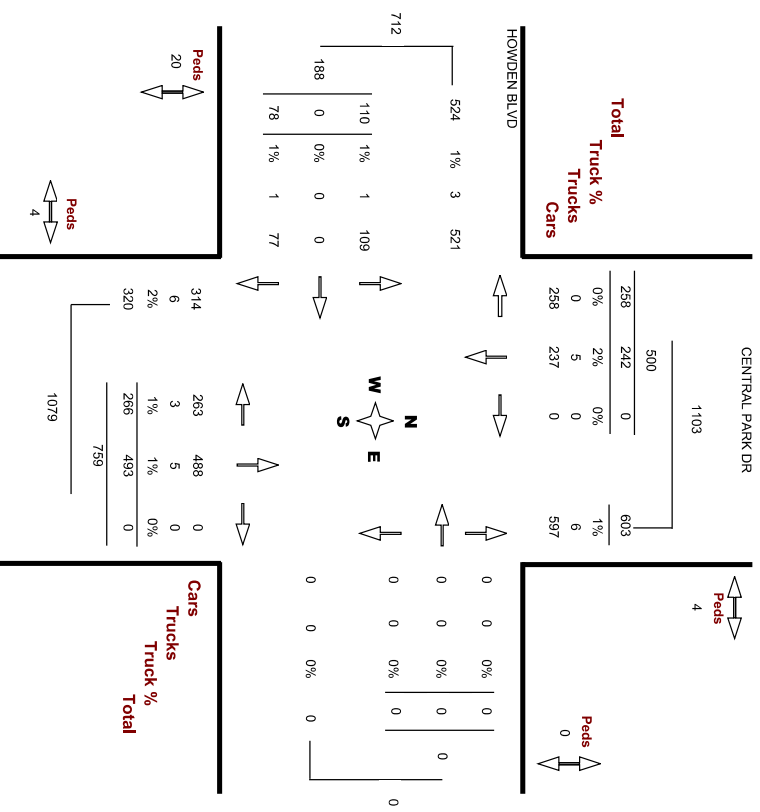
Turning Movements Report - AM Period

Location:..... CENTRAL PARK DR @ HOWDEN BLVD Geold:..... 2707
 Municipality: Brampton Count Date: Tuesday, 12 June, 2018
 Traffic Cont: Traffic signal Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... None Peak Hour:.. 07:45 AM — 08:45 AM



Turning Movements Report - PM Period

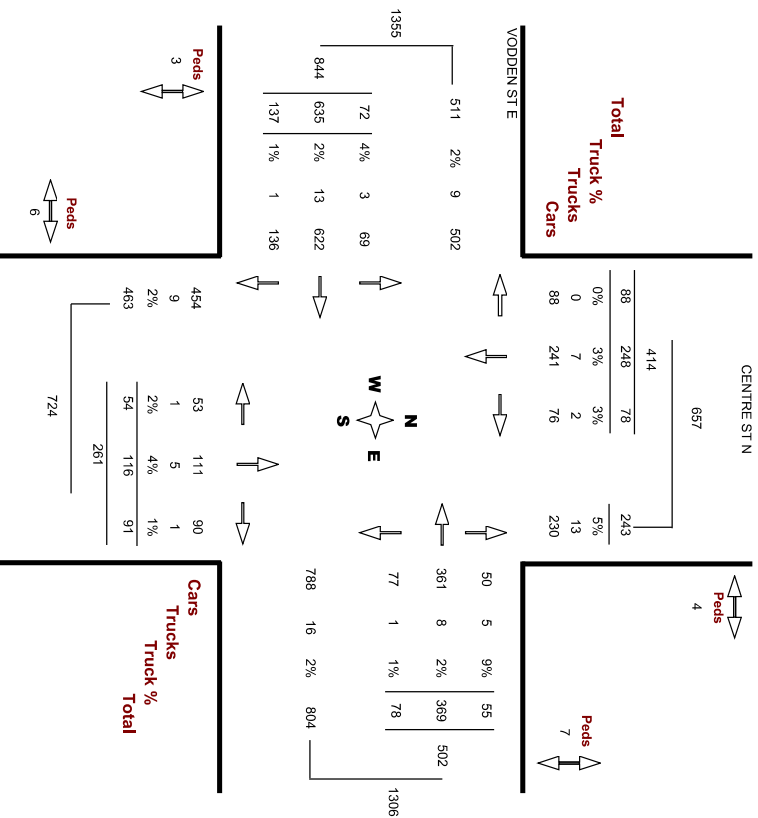
Location:..... CENTRAL PARK DR @ HOWDEN BLVD Geold:..... 2707
 Municipality: Brampton Count Date: Tuesday, 12 June, 2018
 Traffic Cont: Traffic signal Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... None Peak Hour:.. 05:00 PM — 06:00 PM





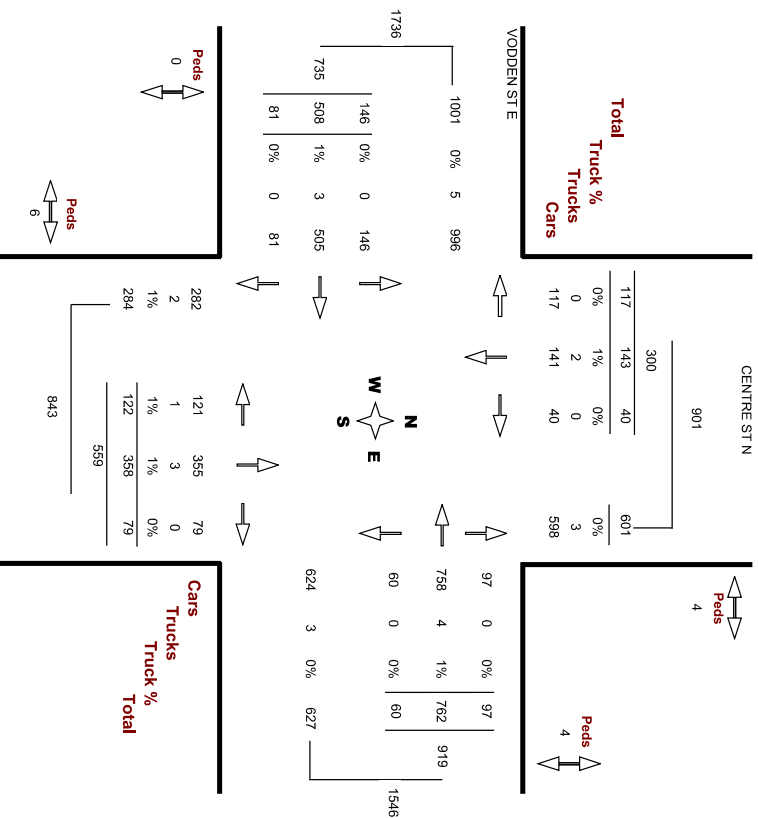
Turning Movements Report - AM Period

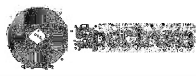
Location:..... CENTRE ST N @ VODDEN STE GeolD:..... 1374
 Municipality: Brampton Count Date: Tuesday, 04 December, 2018
 Traffic Cont: Traffic signal Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... None Peak Hour: 08:00 AM — 09:00 AM



Turning Movements Report - PM Period

Location:..... CENTRE ST N @ VODDEN STE GeolD:..... 1374
 Municipality: Brampton Count Date: Tuesday, 04 December, 2018
 Traffic Cont: Traffic signal Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... None Peak Hour: 05:00 PM — 06:00 PM





Peak Hour: 05:00 PM - 06:00 PM Weather: Overcast (23.8 °C)

| Start Time | Southbound DIXIE RD | | | | | | Westbound HOWDEN BLVD | | | | | | Northbound DIXIE RD | | | | | | Eastbound HOWDEN BLVD | | | | | | Int. Total (15 min) |
|-------------------------------|---------------------|------------|-----------|----------|----------|----------------|-----------------------|------------|-----------|----------|----------|----------------|---------------------|-------------|------------|----------|----------|----------------|-----------------------|------------|------------|----------|-----------|----------------|---------------------|
| | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | |
| 17:00:00 | 12 | 148 | 3 | 0 | 1 | 163 | 20 | 118 | 16 | 0 | 0 | 154 | 100 | 403 | 30 | 0 | 0 | 533 | 11 | 58 | 43 | 0 | 4 | 112 | 962 |
| 17:15:00 | 12 | 144 | 11 | 0 | 0 | 167 | 18 | 137 | 27 | 0 | 0 | 182 | 69 | 414 | 31 | 0 | 0 | 514 | 13 | 56 | 46 | 0 | 0 | 115 | 978 |
| 17:30:00 | 11 | 137 | 5 | 0 | 7 | 153 | 27 | 130 | 26 | 0 | 2 | 183 | 84 | 387 | 28 | 0 | 7 | 499 | 9 | 48 | 38 | 0 | 5 | 95 | 930 |
| 17:45:00 | 13 | 149 | 16 | 0 | 1 | 178 | 14 | 89 | 17 | 0 | 5 | 120 | 89 | 426 | 37 | 0 | 0 | 552 | 5 | 68 | 37 | 0 | 2 | 110 | 960 |
| Grand Total | 48 | 578 | 35 | 0 | 9 | 661 | 79 | 474 | 86 | 0 | 7 | 639 | 342 | 1630 | 126 | 0 | 7 | 2098 | 38 | 230 | 164 | 0 | 11 | 432 | 3830 |
| Approach% | 7.3% | 87.4% | 5.3% | 0% | - | - | 12.4% | 74.2% | 13.5% | 0% | - | - | 16.3% | 77.7% | 6% | 0% | - | - | 8.8% | 53.2% | 38% | 0% | - | - | - |
| Totals | 1.3% | 15.1% | 0.9% | 0% | 17.3% | 2.1% | 12.4% | 2.2% | 0% | 16.7% | 8.9% | 42.6% | 3.3% | 0% | 54.8% | 1% | 6% | 4.3% | 0% | 11.3% | - | - | - | | |
| PHF | 0.92 | 0.97 | 0.55 | 0 | 0.93 | 0.73 | 0.86 | 0.8 | 0 | 0.87 | 0.86 | 0.96 | 0.85 | 0 | 0.95 | 0.73 | 0.85 | 0.89 | 0 | 0.94 | - | - | - | | |
| Heavy | 1 | 18 | 0 | 0 | 19 | 1 | 7 | 0 | 0 | 8 | 4 | 18 | 2 | 0 | 24 | 0 | 6 | 1 | 0 | 7 | - | - | - | | |
| Heavy % | 2.1% | 3.1% | 0% | 0% | 2.9% | 1.3% | 1.5% | 0% | 0% | 1.3% | 1.2% | 1.1% | 1.6% | 0% | 1.1% | 0% | 2.6% | 0.6% | 0% | 1.6% | - | - | - | | |
| Lights | 47 | 560 | 35 | 0 | 642 | 78 | 467 | 86 | 0 | 631 | 338 | 1612 | 124 | 0 | 2074 | 38 | 224 | 163 | 0 | 425 | - | - | - | | |
| Lights % | 97.9% | 96.9% | 100% | 0% | 97.1% | 98.7% | 98.5% | 100% | 0% | 98.7% | 98.8% | 98.9% | 98.4% | 0% | 98.9% | 100% | 97.4% | 99.4% | 0% | 98.4% | - | - | - | | |
| Single-Unit Trucks | 1 | 7 | 0 | 0 | 8 | 1 | 0 | 0 | 0 | 1 | 3 | 1 | 1 | 0 | 5 | 0 | 1 | 1 | 0 | 2 | - | - | - | | |
| Single-Unit Trucks % | 2.1% | 1.2% | 0% | 0% | 1.2% | 1.3% | 0% | 0% | 0% | 0.2% | 0.9% | 0.1% | 0.8% | 0% | 0.2% | 0% | 0.4% | 0.6% | 0% | 0.5% | - | - | - | | |
| Buses | 0 | 10 | 0 | 0 | 10 | 0 | 7 | 0 | 0 | 7 | 1 | 12 | 1 | 0 | 14 | 0 | 5 | 0 | 0 | 5 | - | - | - | | |
| Buses % | 0% | 1.7% | 0% | 0% | 1.5% | 0% | 1.5% | 0% | 0% | 1.1% | 0.3% | 0.7% | 0.8% | 0% | 0.7% | 0% | 2.2% | 0% | 0% | 1.2% | - | - | - | | |
| Articulated Trucks | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | |
| Articulated Trucks % | 0% | 0.2% | 0% | 0% | 0.2% | 0% | 0% | 0% | 0% | 0% | 0% | 0.3% | 0% | 0% | 0.2% | 0% | 0% | 0% | 0% | 0% | - | - | - | | |
| Pedestrians | - | - | - | - | 9 | - | - | - | - | 6 | - | - | - | 7 | - | - | - | - | 10 | - | - | - | | | |
| Pedestrians% | - | - | - | - | 26.5% | - | - | - | - | 17.6% | - | - | - | 20.6% | - | - | - | - | 23.4% | - | - | - | | | |
| Bicycles on Crosswalk | - | - | - | - | 0 | - | - | - | - | 1 | - | - | - | 0 | - | - | - | - | 1 | - | - | - | | | |
| Bicycles on Crosswalk% | - | - | - | - | 0% | - | - | - | - | 2.9% | - | - | - | 0% | - | - | - | - | 2.9% | - | - | - | | | |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Bicycles on Road% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | 0% | - | - | - | - | 0% | - | - | - | | | |



Peak Hour: 08:00 AM - 09:00 AM Weather: Mostly Cloudy (19.4 °C)

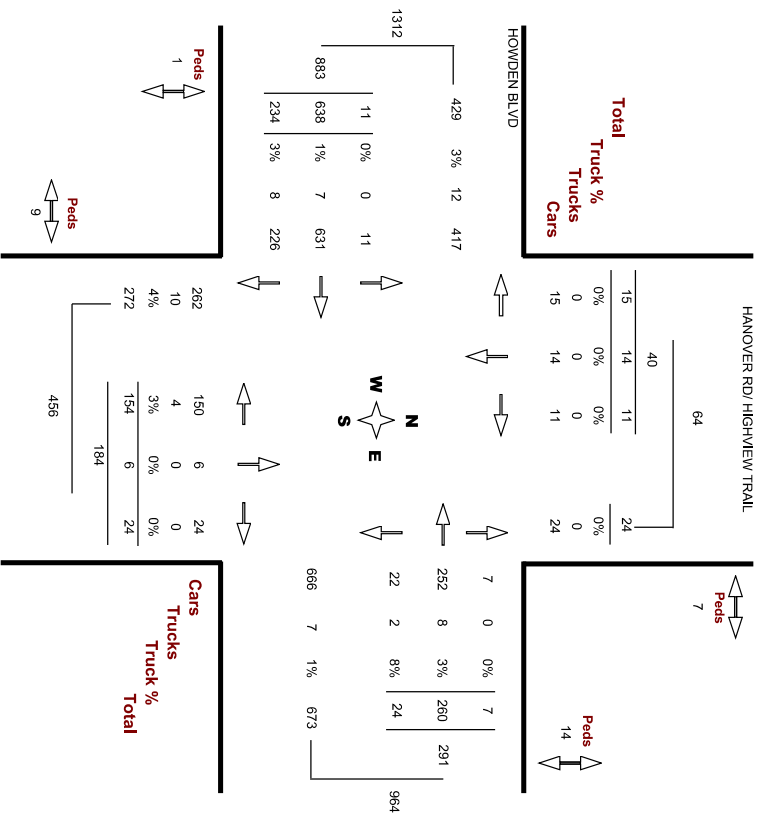
| Start Time | Southbound DIXIE RD | | | | | | Westbound HOWDEN BLVD | | | | | | Northbound DIXIE RD | | | | | | Eastbound HOWDEN BLVD | | | | | | Int. Total (15 min) |
|-------------------------------|---------------------|-------------|-----------|----------|----------|----------------|-----------------------|------------|-----------|----------|----------|----------------|---------------------|------------|-----------|----------|-----------|----------------|-----------------------|------------|------------|----------|-----------|----------------|---------------------|
| | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | |
| 08:00:00 | 48 | 434 | 2 | 0 | 0 | 484 | 26 | 51 | 31 | 0 | 0 | 108 | 8 | 110 | 17 | 0 | 6 | 135 | 6 | 127 | 52 | 0 | 2 | 185 | 912 |
| 08:15:00 | 41 | 463 | 5 | 0 | 0 | 509 | 19 | 65 | 24 | 0 | 0 | 108 | 15 | 106 | 22 | 0 | 0 | 143 | 5 | 127 | 65 | 0 | 4 | 197 | 957 |
| 08:30:00 | 30 | 369 | 11 | 0 | 0 | 410 | 24 | 66 | 23 | 0 | 1 | 113 | 16 | 106 | 17 | 0 | 7 | 139 | 11 | 110 | 49 | 1 | 3 | 171 | 833 |
| 08:45:00 | 38 | 435 | 1 | 0 | 0 | 474 | 31 | 57 | 14 | 0 | 0 | 102 | 13 | 91 | 20 | 0 | 7 | 124 | 7 | 99 | 53 | 0 | 5 | 159 | 859 |
| Grand Total | 157 | 1701 | 19 | 0 | 0 | 1877 | 100 | 239 | 92 | 0 | 1 | 431 | 52 | 413 | 76 | 0 | 20 | 541 | 29 | 463 | 219 | 1 | 14 | 712 | 3561 |
| Approach% | 8.4% | 90.6% | 1% | 0% | - | - | 23.2% | 55.5% | 21.3% | 0% | - | - | 9.6% | 76.3% | 14% | 0% | - | - | 4.1% | 69% | 30.8% | 0.1% | - | - | - |
| Totals | 4.4% | 47.8% | 0.9% | 0% | 52.7% | 2.8% | 6.7% | 2.6% | 0% | 12.1% | 1.5% | 11.6% | 2.1% | 0% | 15.2% | 0.8% | 13% | 6.1% | 0% | 20% | - | - | - | | |
| PHF | 0.82 | 0.92 | 0.43 | 0 | 0.92 | 0.81 | 0.91 | 0.74 | 0 | 0.95 | 0.81 | 0.94 | 0.86 | 0 | 0.95 | 0.66 | 0.91 | 0.84 | 0.25 | 0.9 | - | - | - | | |
| Heavy | 6 | 34 | 0 | 0 | 40 | 1 | 15 | 2 | 0 | 18 | 0 | 37 | 4 | 0 | 41 | 0 | 11 | 3 | 0 | 14 | - | - | - | | |
| Heavy % | 3.8% | 2% | 0% | 0% | 2.1% | 1% | 6.3% | 2.2% | 0% | 4.2% | 0% | 9% | 5.3% | 0% | 7.6% | 0% | 2.4% | 1.4% | 0% | 2% | - | - | - | | |
| Lights | 151 | 1667 | 19 | 0 | 1837 | 99 | 224 | 90 | 0 | 413 | 52 | 376 | 72 | 0 | 500 | 29 | 452 | 216 | 1 | 688 | - | - | - | | |
| Lights % | 96.2% | 98% | 100% | 0% | 97.9% | 99% | 93.7% | 97.8% | 0% | 95.8% | 100% | 91% | 94.7% | 0% | 92.4% | 100% | 97.6% | 98.6% | 100% | 98% | - | - | - | | |
| Single-Unit Trucks | 0 | 8 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 1 | 0 | 14 | 0 | 1 | 0 | 0 | 1 | - | - | - | | |
| Single-Unit Trucks % | 0% | 0.5% | 0% | 0% | 0.4% | 0% | 0% | 0% | 0% | 0% | 0% | 3.1% | 1.3% | 0% | 2.6% | 0% | 0.2% | 0% | 0% | 0.1% | - | - | - | | |
| Buses | 6 | 18 | 0 | 0 | 24 | 1 | 15 | 2 | 0 | 18 | 0 | 20 | 3 | 0 | 23 | 0 | 10 | 3 | 0 | 13 | - | - | - | | |
| Buses % | 3.8% | 1.1% | 0% | 0% | 1.3% | 1% | 6.3% | 2.2% | 0% | 4.2% | 0% | 4.8% | 3.9% | 0% | 4.3% | 0% | 2.2% | 1.4% | 0% | 1.8% | - | - | - | | |
| Articulated Trucks | 0 | 8 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Articulated Trucks % | 0% | 0.5% | 0% | 0% | 0.4% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 0% | 0.7% | 0% | 0% | 0% | 0% | 0% | - | - | - | | |
| Pedestrians | - | - | - | - | 0 | - | - | - | - | 1 | - | - | - | 18 | - | - | - | - | 14 | - | - | - | | | |
| Pedestrians% | - | - | - | - | 0% | - | - | - | - | 2.9% | - | - | - | 51.4% | - | - | - | - | 40% | - | - | - | | | |
| Bicycles on Crosswalk | - | - | - | - | 0 | - | - | - | - | 0 | - | - | - | 2 | - | - | - | - | 0 | - | - | - | | | |
| Bicycles on Crosswalk% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | 5.7% | - | - | - | - | 0% | - | - | - | | | |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Bicycles on Road% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | 0% | - | - | - | - | 0% | - | - | - | | | |



Turning Movements Report - AM Period

Location:..... HANOVER RD/ HIGHVIEW TRAIL @ HOWDEN BLVD
 Municipality: Brampton
 Traffic Cont: Stop sign
 Major Dir:..... East west

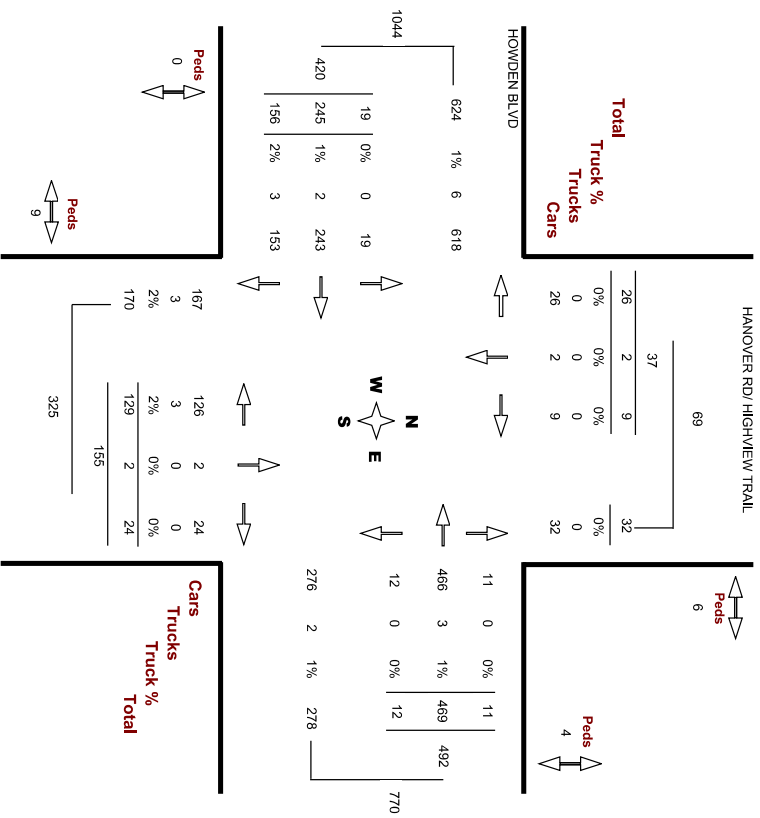
GeoID:..... 379
 Count Date: Wednesday, 16 September, 2015
 Count Time: 07:00 AM — 09:00 AM
 Peak Hour: 07:30 AM — 08:30 AM



Turning Movements Report - PM Period

Location:..... HANOVER RD/ HIGHVIEW TRAIL @ HOWDEN BLVD
 Municipality: Brampton
 Traffic Cont: Stop sign
 Major Dir:..... East west

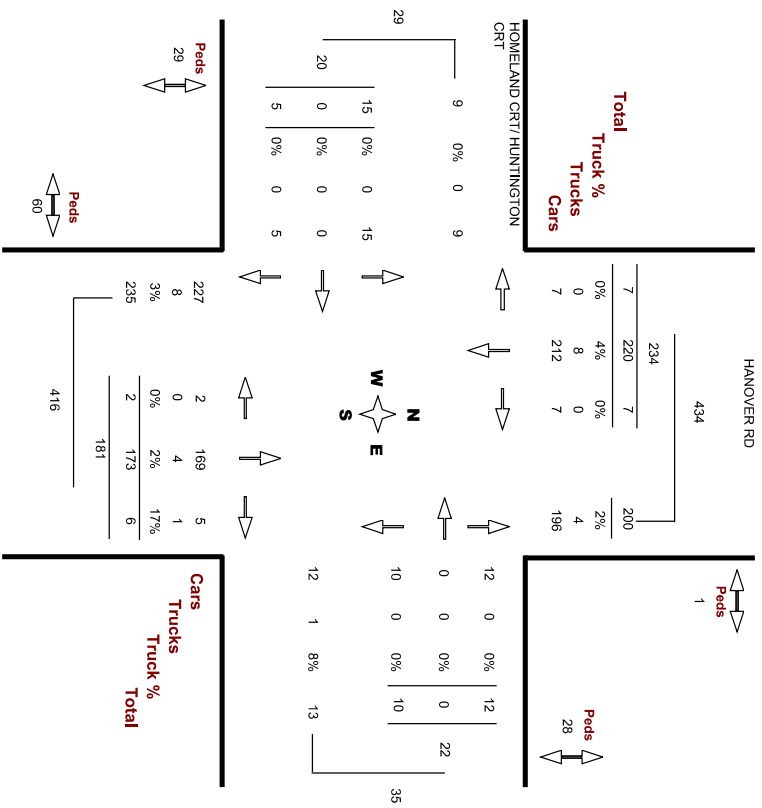
GeoID:..... 379
 Count Date: Wednesday, 16 September, 2015
 Count Time: 03:00 PM — 06:00 PM
 Peak Hour: 04:45 PM — 05:45 PM



Turning Movements Report - AM Period



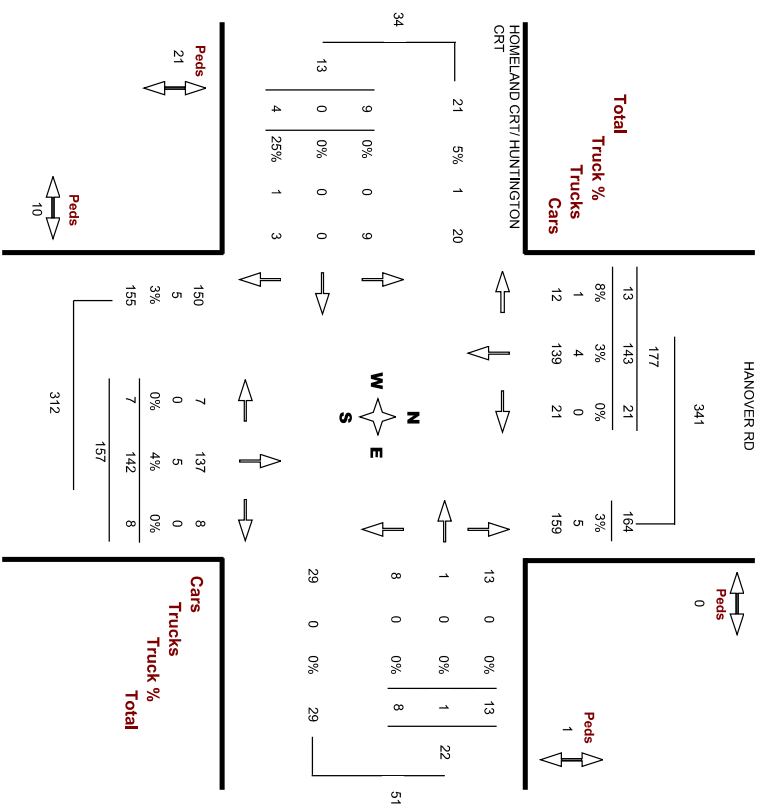
Location:..... HANOVER RD @ HOMELAND CRT/
 HUNTINGTON CRT GeolD:..... 2875
 Municipality: Brampton Count Date: Thursday, 13 September, 2018
 Traffic Cont: Stop sign Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... None Peak Hour:.. 08:00 AM — 09:00 AM



Turning Movements Report - PM Period



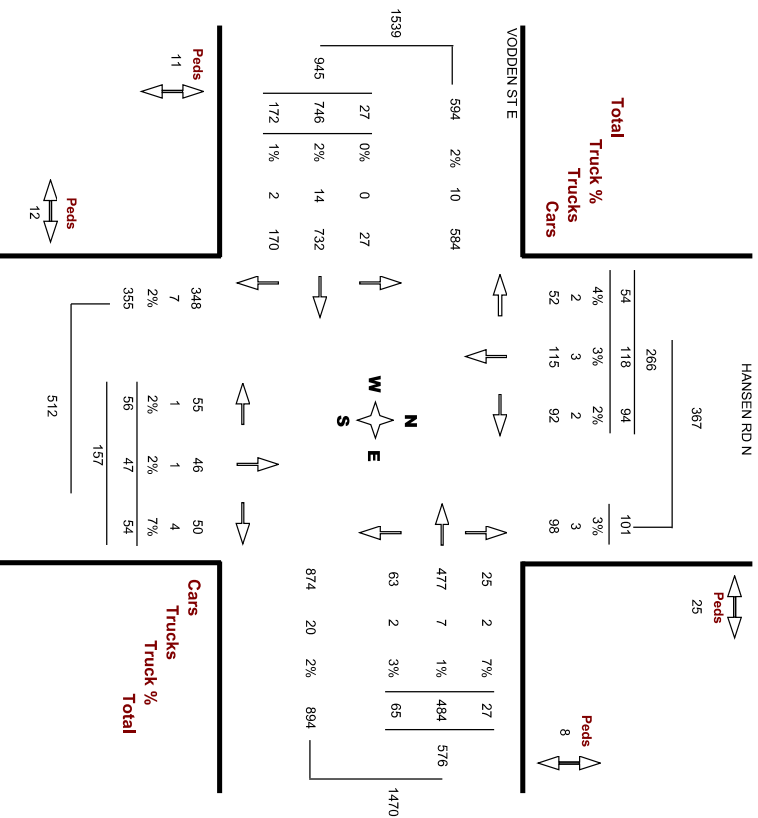
Location:..... HANOVER RD @ HOMELAND CRT/
 HUNTINGTON CRT GeolD:..... 2875
 Municipality: Brampton Count Date: Thursday, 13 September, 2018
 Traffic Cont: Stop sign Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... None Peak Hour:.. 04:30 PM — 05:30 PM





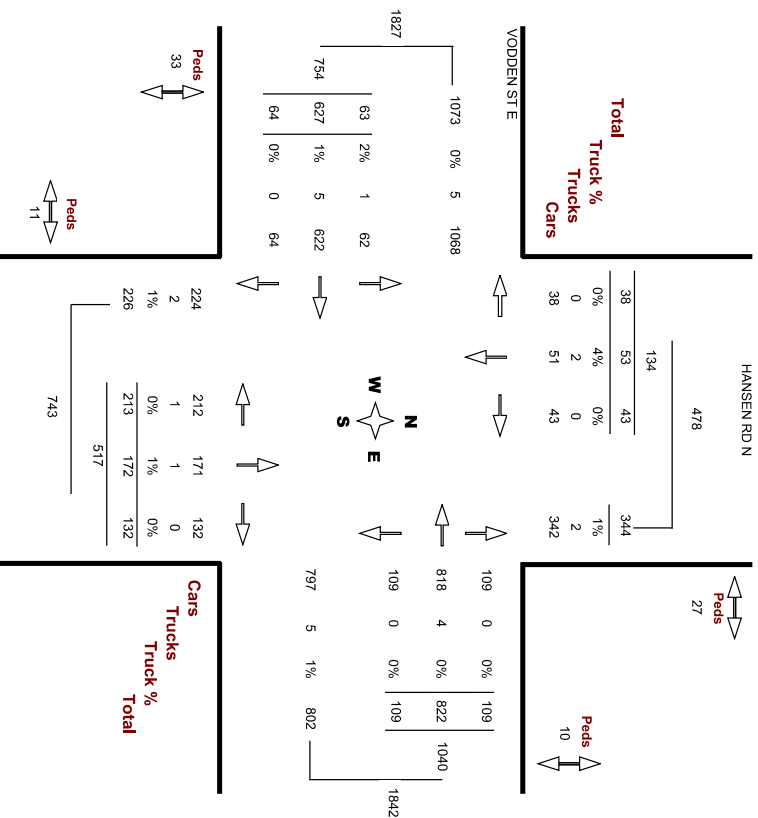
Turning Movements Report - AM Period

Location:..... HANSEN RD N @ VODDEN STE GeolD..... 999
 Municipality: Brampton Count Date: Wednesday, 24 October, 2018
 Traffic Cont: Traffic signal Count Time: 07:00 AM — 09:00 AM
 Major Dir..... None Peak Hour.. 08:00 AM — 09:00 AM



Turning Movements Report - PM Period

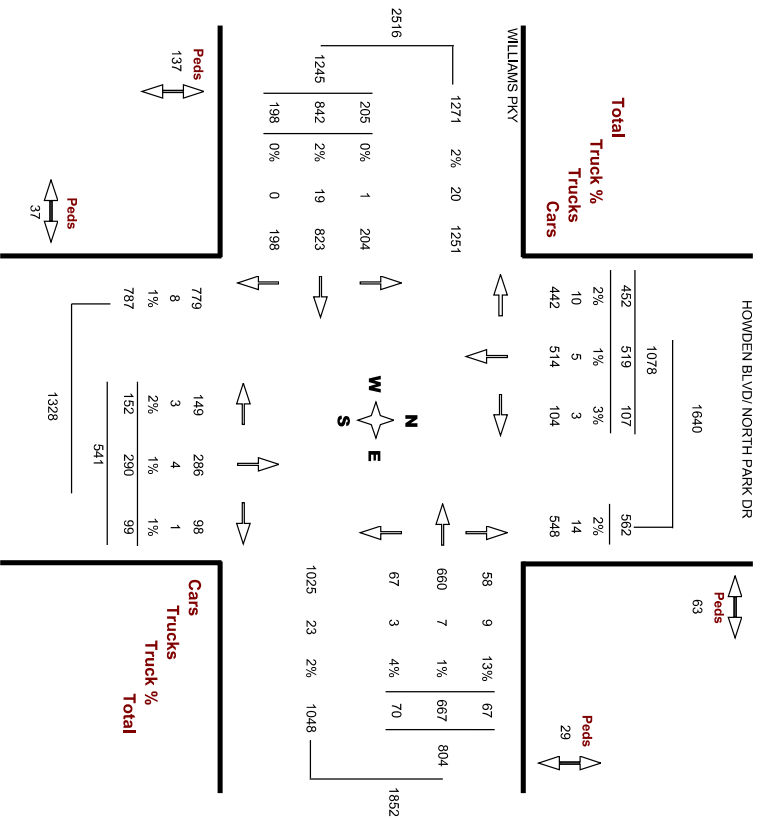
Location:..... HANSEN RD N @ VODDEN STE GeolD..... 999
 Municipality: Brampton Count Date: Wednesday, 24 October, 2018
 Traffic Cont: Traffic signal Count Time: 03:00 PM — 06:00 PM
 Major Dir..... None Peak Hour.. 05:00 PM — 06:00 PM





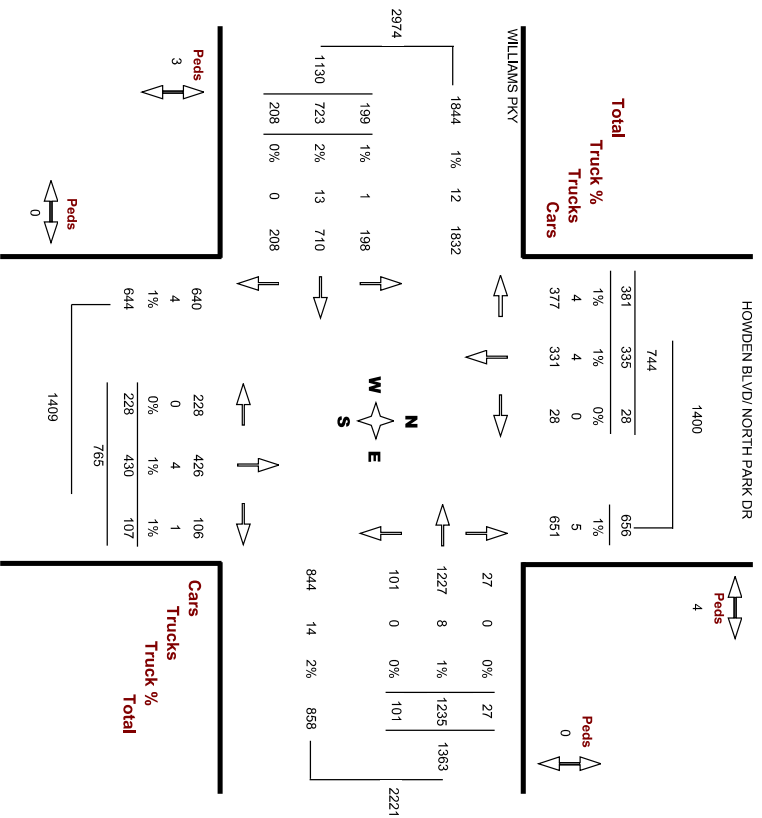
Turning Movements Report - AM Period

Location:..... HOWDEN BLVD/ NORTH PARK DR @ WILLIAMS PKY
 GeolD:..... 2764
 Municipality: Brampton
 Count Date: Tuesday, 04 December, 2018
 Traffic Cont: Traffic signal
 Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... None
 Peak Hour:.. 07:45 AM — 08:45 AM



Turning Movements Report - PM Period

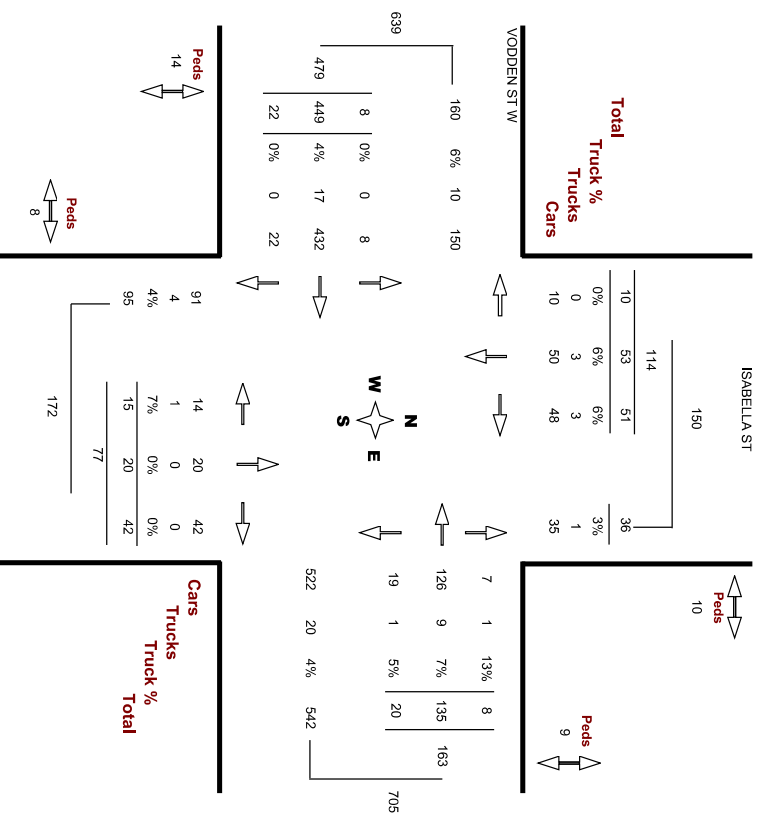
Location:..... HOWDEN BLVD/ NORTH PARK DR @ WILLIAMS PKY
 GeolD:..... 2764
 Municipality: Brampton
 Count Date: Tuesday, 04 December, 2018
 Traffic Cont: Traffic signal
 Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... None
 Peak Hour:.. 04:30 PM — 05:30 PM





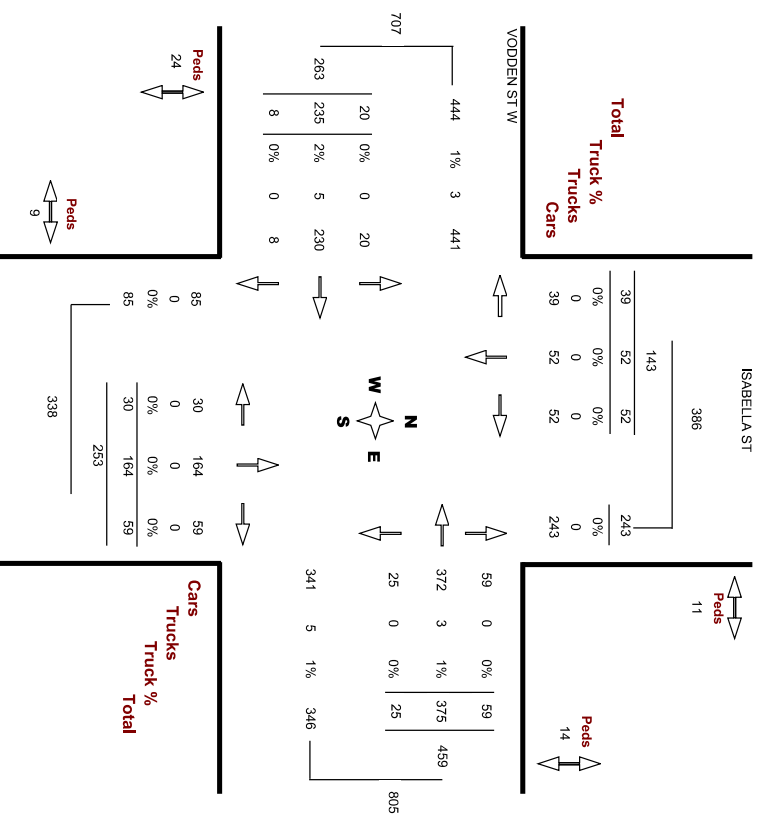
Turning Movements Report - AM Period

Location:..... ISABELLA ST @ VODDEN ST W GeolD..... 3557
 Municipality: Brampton Count Date: Thursday, 16 January, 2020
 Traffic Cont. Stop sign Count Time: 07:00 AM — 09:00 AM
 Major Dir..... None Peak Hour.. 07:30 AM — 08:30 AM



Turning Movements Report - PM Period

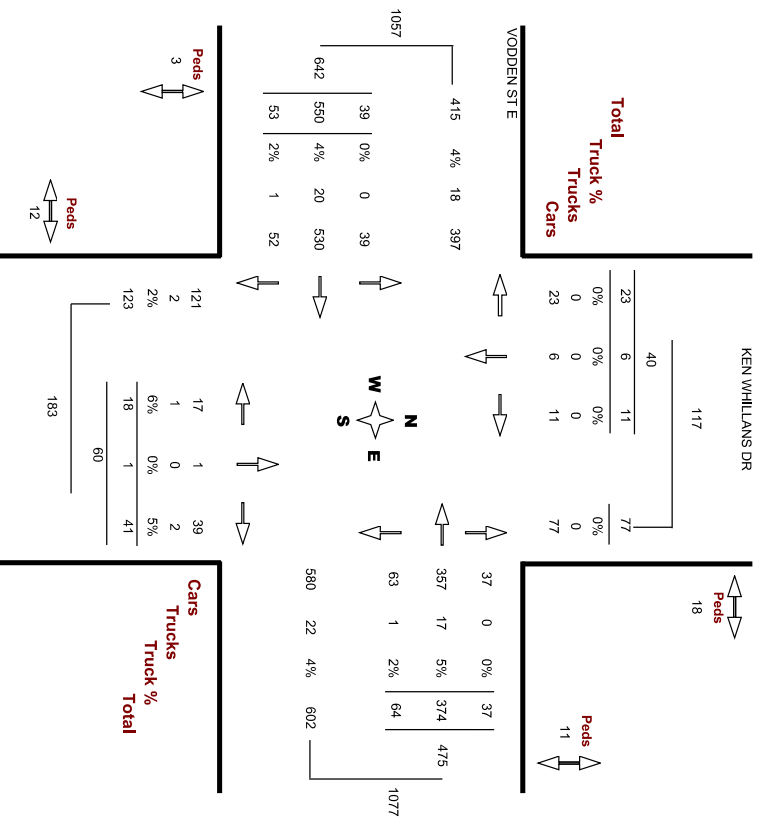
Location:..... ISABELLA ST @ VODDEN ST W GeolD..... 3557
 Municipality: Brampton Count Date: Thursday, 16 January, 2020
 Traffic Cont. Stop sign Count Time: 03:00 PM — 06:00 PM
 Major Dir..... None Peak Hour.. 04:45 PM — 05:45 PM





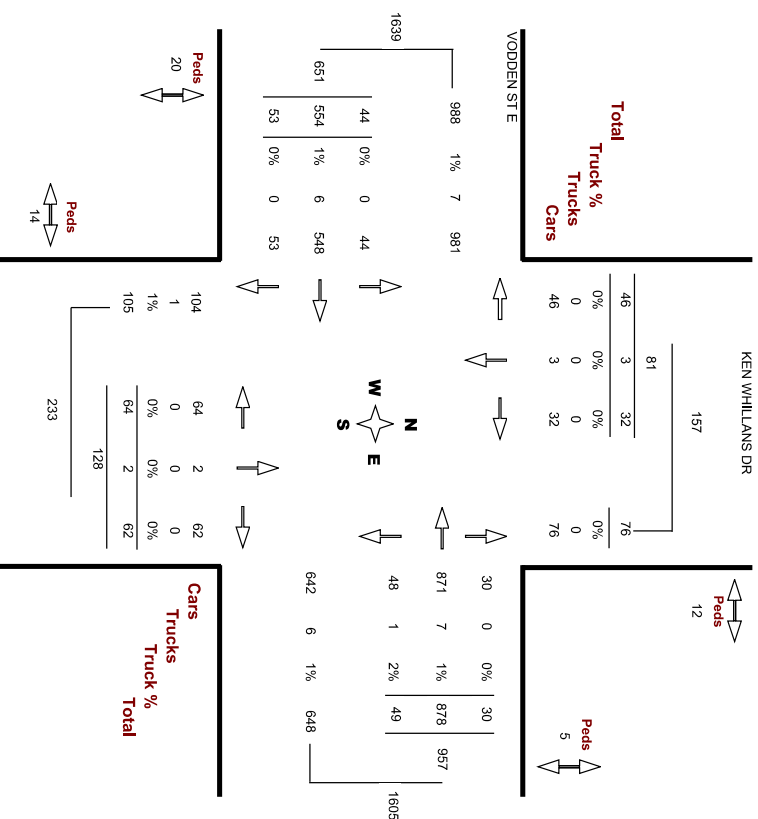
Turning Movements Report - AM Period

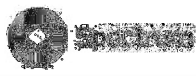
Location:..... KEN WHILLANS DR @ VODDEN STE Geold:..... 3016
 Municipality: Brampton Count Date: Wednesday, 10 June, 2015
 Traffic Cont. Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... East west Peak Hour:.. 08:00 AM — 09:00 AM



Turning Movements Report - PM Period

Location:..... KEN WHILLANS DR @ VODDEN STE Geold:..... 3016
 Municipality: Brampton Count Date: Wednesday, 10 June, 2015
 Traffic Cont. Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... East west Peak Hour:.. 04:45 PM — 05:45 PM





Peak Hour: 05:00 PM - 06:00 PM Weather: Mostly Cloudy (2.3 °C)

| Start Time | Southbound KENNEDY RD | | | | | | Westbound VODDEN ST E | | | | | | Northbound KENNEDY RD | | | | | | Eastbound VODDEN ST E | | | | | | Int. Total (15 min) |
|------------------------|--------------------------|------------|-----------|----------|-----------|----------------|--------------------------|------------|------------|----------|-----------|----------------|--------------------------|-------------|-----------|----------|-----------|----------------|--------------------------|------------|------------|----------|-----------|----------------|------------------------|
| | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | |
| 17:00:00 | 27 | 149 | 14 | 0 | 9 | 190 | 35 | 136 | 72 | 0 | 7 | 243 | 44 | 278 | 25 | 0 | 4 | 347 | 16 | 101 | 25 | 0 | 2 | 142 | 922 |
| 17:15:00 | 34 | 169 | 19 | 0 | 9 | 222 | 33 | 136 | 55 | 0 | 7 | 224 | 44 | 300 | 23 | 0 | 8 | 367 | 14 | 110 | 28 | 1 | 9 | 153 | 966 |
| 17:30:00 | 34 | 139 | 10 | 0 | 8 | 183 | 28 | 166 | 67 | 0 | 7 | 261 | 32 | 276 | 24 | 0 | 12 | 332 | 19 | 115 | 23 | 0 | 11 | 157 | 933 |
| 17:45:00 | 42 | 184 | 17 | 0 | 12 | 243 | 25 | 112 | 62 | 0 | 7 | 199 | 52 | 282 | 23 | 0 | 3 | 357 | 18 | 101 | 27 | 0 | 1 | 146 | 945 |
| Grand Total | 137 | 641 | 60 | 0 | 38 | 838 | 121 | 550 | 256 | 0 | 28 | 927 | 172 | 1136 | 95 | 0 | 27 | 1403 | 67 | 427 | 103 | 1 | 23 | 598 | 3766 |
| Approach% | 16.3% | 76.5% | 7.2% | 0% | - | - | 13.1% | 59.3% | 27.6% | 0% | - | - | 12.3% | 81% | 6.8% | 0% | - | - | 11.2% | 71.4% | 17.2% | 0.2% | - | - | - |
| Totals | 3.6% | 17% | 1.6% | 0% | 22.3% | 3.2% | 14.6% | 6.8% | 0% | 24.6% | 4.6% | 30.2% | 2.5% | 0% | 37.3% | 1.8% | 11.3% | 2.7% | 0% | 15.9% | - | - | - | - | - |
| PHF | 0.82 | 0.87 | 0.79 | 0 | 0.86 | 0.86 | 0.83 | 0.89 | 0 | 0.89 | 0.83 | 0.95 | 0.95 | 0 | 0.96 | 0.88 | 0.93 | 0.92 | 0.25 | 0.95 | - | - | - | - | - |
| Heavy | 0 | 12 | 0 | 0 | 12 | 2 | 4 | 0 | 0 | 6 | 1 | 16 | 2 | 0 | 19 | 0 | 3 | 1 | 0 | 4 | - | - | - | - | - |
| Heavy % | 0% | 1.9% | 0% | 0% | 1.4% | 1.7% | 0.7% | 0% | 0% | 0.6% | 0.6% | 1.4% | 2.1% | 0% | 1.4% | 0% | 0.7% | 1% | 0% | 0.7% | - | - | - | - | - |
| Lights | 137 | 629 | 60 | 0 | 826 | 119 | 546 | 256 | 0 | 921 | 171 | 1120 | 93 | 0 | 1384 | 67 | 424 | 102 | 1 | 594 | - | - | - | - | - |
| Lights % | 100% | 98.1% | 100% | 0% | 98.6% | 98.3% | 93.3% | 100% | 0% | 99.4% | 99.4% | 98.6% | 97.9% | 0% | 98.6% | 100% | 99.3% | 99% | 100% | 99.3% | - | - | - | - | - |
| Single-Unit Trucks | 0 | 3 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 1 | 1 | 5 | 1 | 0 | 7 | 0 | 1 | 1 | 0 | 2 | - | - | - | - | - |
| Single-Unit Trucks % | 0% | 0.5% | 0% | 0% | 0.4% | 0% | 0.2% | 0% | 0% | 0.1% | 0.6% | 0.4% | 1.1% | 0% | 0.5% | 0% | 0.2% | 1% | 0% | 0.3% | - | - | - | - | - |
| Buses | 0 | 8 | 0 | 0 | 8 | 2 | 3 | 0 | 0 | 5 | 0 | 8 | 1 | 0 | 9 | 0 | 2 | 0 | 0 | 2 | - | - | - | - | - |
| Buses % | 0% | 1.2% | 0% | 0% | 1% | 1.7% | 0.9% | 0% | 0% | 0.5% | 0% | 0.7% | 1.1% | 0% | 0.6% | 0% | 0.5% | 0% | 0% | 0.3% | - | - | - | - | - |
| Articulated Trucks | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| Articulated Trucks % | 0% | 0.2% | 0% | 0% | 0.1% | 0% | 0% | 0% | 0% | 0% | 0% | 0.3% | 0% | 0% | 0.2% | 0% | 0% | 0% | 0% | 0% | - | - | - | - | - |
| Pedestrians | - | - | - | - | 36 | - | - | - | - | 26 | - | - | - | - | 26 | - | - | - | - | 22 | - | - | - | - | - |
| Pedestrians% | - | - | - | - | 31% | - | - | - | - | 22.4% | - | - | - | - | 22.4% | - | - | - | - | 19% | - | - | - | - | - |
| Bicycles on Crosswalk | - | - | - | - | 2 | - | - | - | - | 2 | - | - | - | - | 1 | - | - | - | - | 1 | - | - | - | - | - |
| Bicycles on Crosswalk% | - | - | - | - | 1.7% | - | - | - | - | 1.7% | - | - | - | - | 0.9% | - | - | - | - | 0.9% | - | - | - | - | - |
| Bicycles on Road | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| Bicycles on Road% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | - | - |



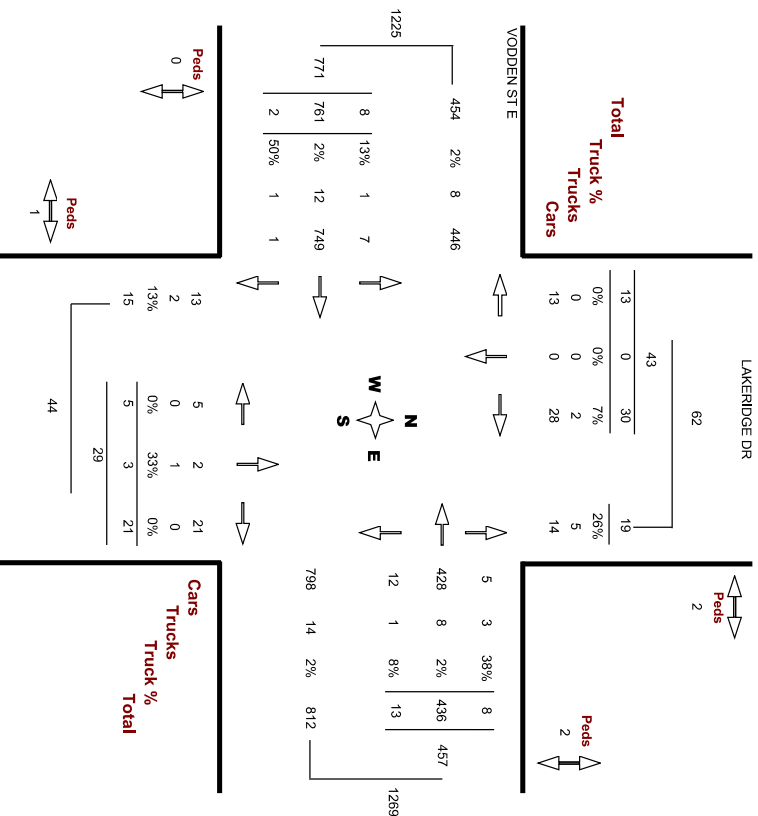
Peak Hour: 08:00 AM - 09:00 AM Weather: Mostly Cloudy (1.2 °C)

| Start Time | Southbound KENNEDY RD | | | | | | Westbound VODDEN ST E | | | | | | Northbound KENNEDY RD | | | | | | Eastbound VODDEN ST E | | | | | | Int. Total (15 min) |
|------------------------|--------------------------|-------------|-----------|----------|-----------|----------------|--------------------------|------------|-----------|----------|-----------|----------------|--------------------------|------------|-----------|----------|-----------|----------------|--------------------------|------------|-----------|----------|-----------|----------------|------------------------|
| | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | Left | Thru | Right | U-Turn | Peds | Approach Total | |
| 08:00:00 | 64 | 318 | 7 | 0 | 12 | 389 | 37 | 72 | 19 | 0 | 17 | 128 | 21 | 109 | 31 | 0 | 9 | 161 | 8 | 104 | 25 | 0 | 12 | 137 | 815 |
| 08:15:00 | 54 | 239 | 13 | 0 | 7 | 306 | 35 | 90 | 18 | 0 | 2 | 143 | 17 | 101 | 30 | 0 | 3 | 148 | 13 | 136 | 27 | 0 | 5 | 176 | 773 |
| 08:30:00 | 59 | 277 | 17 | 0 | 9 | 353 | 31 | 90 | 22 | 0 | 2 | 143 | 19 | 92 | 12 | 0 | 4 | 123 | 8 | 92 | 22 | 0 | 9 | 122 | 741 |
| 08:45:00 | 56 | 247 | 36 | 1 | 6 | 340 | 28 | 82 | 15 | 0 | 2 | 125 | 17 | 96 | 17 | 0 | 1 | 130 | 10 | 112 | 25 | 0 | 5 | 147 | 742 |
| Grand Total | 233 | 1081 | 73 | 1 | 34 | 1388 | 131 | 334 | 74 | 0 | 23 | 539 | 74 | 398 | 90 | 0 | 17 | 562 | 39 | 444 | 99 | 0 | 31 | 582 | 3071 |
| Approach% | 16.8% | 77.9% | 5.3% | 0.1% | - | - | 24.3% | 62% | 13.7% | 0% | - | - | 13.2% | 70.8% | 16% | 0% | - | - | 6.7% | 76.3% | 17% | 0% | - | - | - |
| Totals | 7.6% | 35.2% | 2.4% | 0% | 45.2% | 4.3% | 10.9% | 2.4% | 0% | 17.6% | 2.4% | 13% | 2.9% | 0% | 18.3% | 1.3% | 14.9% | 3.2% | 0% | 19% | - | - | - | - | - |
| PHF | 0.91 | 0.85 | 0.51 | 0.25 | 0.89 | 0.89 | 0.89 | 0.93 | 0.84 | 0 | 0.94 | 0.88 | 0.91 | 0.73 | 0 | 0.87 | 0.75 | 0.82 | 0.92 | 0 | 0.83 | - | - | - | - |
| Heavy | 7 | 47 | 5 | 0 | 59 | 6 | 11 | 7 | 0 | 24 | 6 | 35 | 4 | 0 | 45 | 0 | 17 | 8 | 0 | 25 | - | - | - | - | |
| Heavy % | 3% | 4.3% | 6.8% | 0% | 4.3% | 4.6% | 3.3% | 3.5% | 0% | 4.5% | 8.1% | 8.8% | 4.4% | 0% | 8% | 0% | 3.8% | 8.1% | 0% | 4.3% | - | - | - | - | |
| Lights | 226 | 1034 | 68 | 1 | 1329 | 125 | 323 | 67 | 0 | 515 | 68 | 363 | 86 | 0 | 517 | 39 | 427 | 91 | 0 | 557 | - | - | - | - | |
| Lights % | 97% | 95.7% | 93.2% | 100% | 95.7% | 95.4% | 96.7% | 90.5% | 0% | 95.5% | 91.9% | 91.2% | 95.6% | 0% | 92% | 100% | 96.2% | 91.9% | 0% | 95.7% | - | - | - | - | |
| Single-Unit Trucks | 3 | 20 | 1 | 0 | 24 | 0 | 5 | 1 | 0 | 6 | 2 | 8 | 1 | 0 | 11 | 0 | 4 | 6 | 0 | 10 | - | - | - | - | |
| Single-Unit Trucks % | 1.3% | 1.9% | 1.4% | 0% | 1.7% | 0% | 1.5% | 1.4% | 0% | 1.1% | 2.7% | 2% | 1.1% | 0% | 2% | 0% | 0.9% | 6.1% | 0% | 1.7% | - | - | - | - | |
| Buses | 4 | 24 | 4 | 0 | 32 | 6 | 6 | 6 | 0 | 18 | 3 | 25 | 2 | 0 | 30 | 0 | 13 | 2 | 0 | 15 | - | - | - | - | |
| Buses % | 1.7% | 2.2% | 5.5% | 0% | 2.3% | 4.6% | 1.8% | 8.1% | 0% | 3.3% | 4.1% | 6.3% | 2.2% | 0% | 5.3% | 0% | 2.9% | 2% | 0% | 2.6% | - | - | - | - | |
| Articulated Trucks | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | |
| Articulated Trucks % | 0% | 0.3% | 0% | 0% | 0.2% | 0% | 0% | 0% | 0% | 0% | 1.4% | 0.5% | 1.1% | 0% | 0.7% | 0% | 0% | 0% | 0% | 0% | - | - | - | - | |
| Pedestrians | - | - | - | - | 34 | - | - | - | - | 22 | - | - | - | - | 16 | - | - | - | - | 30 | - | - | - | - | |
| Pedestrians% | - | - | - | - | 32.4% | - | - | - | - | 21% | - | - | - | - | 15.2% | - | - | - | - | 28.6% | - | - | - | - | |
| Bicycles on Crosswalk | - | - | - | - | 0 | - | - | - | - | 1 | - | - | - | - | 1 | - | - | - | - | 1 | - | - | - | - | |
| Bicycles on Crosswalk% | - | - | - | - | 0% | - | - | - | - | 1% | - | - | - | - | 1% | - | - | - | - | 1% | - | - | - | - | |
| 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 Road% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | - | 0% | - | - | - | - | |



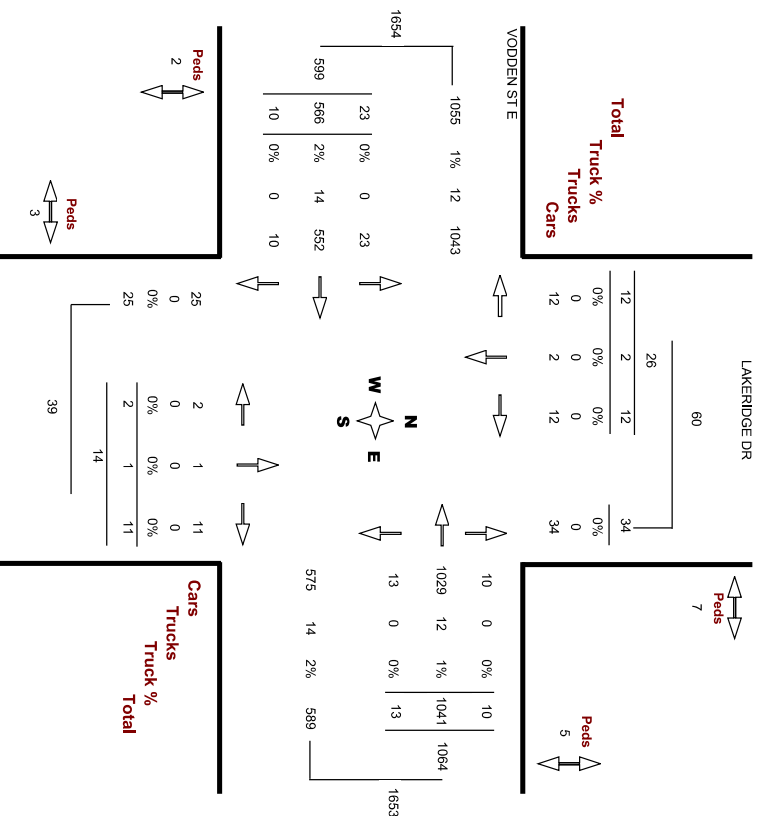
Turning Movements Report - AM Period

Location..... LAKERIDGE DR @ VODDEN ST E GeolD..... 4002
 Municipality.. Brampton Count Date. Wednesday, 31 October, 2018
 Traffic Cont. Stop sign Count Time. 07:00 AM — 09:00 AM
 Major Dir..... East west Peak Hour.. 07:45 AM — 08:45 AM



Turning Movements Report - PM Period

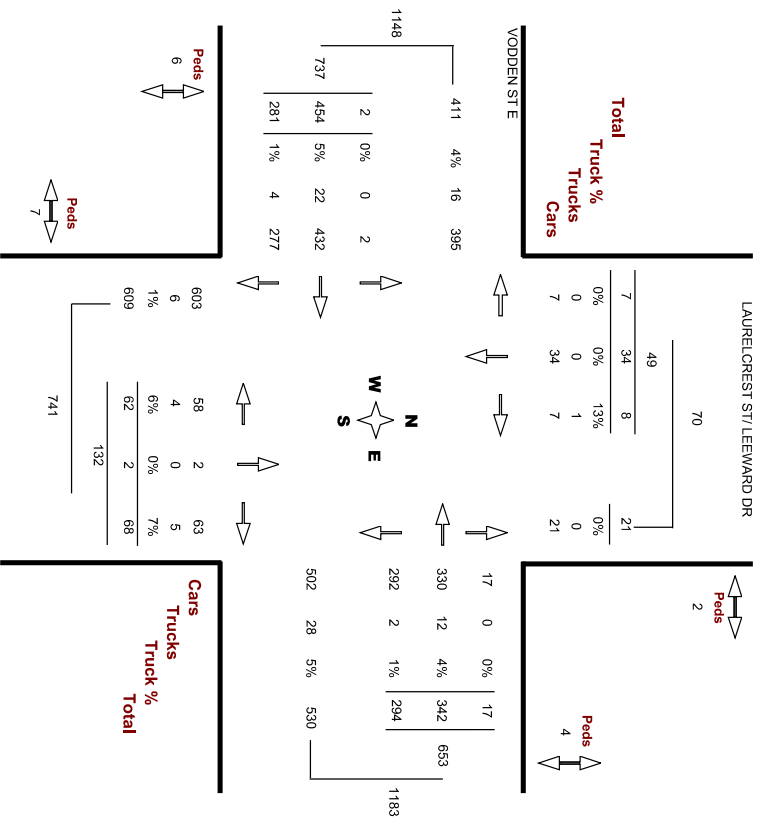
Location..... LAKERIDGE DR @ VODDEN ST E GeolD..... 4002
 Municipality.. Brampton Count Date. Wednesday, 31 October, 2018
 Traffic Cont. Stop sign Count Time. 03:00 PM — 06:00 PM
 Major Dir..... East west Peak Hour.. 04:15 PM — 05:15 PM





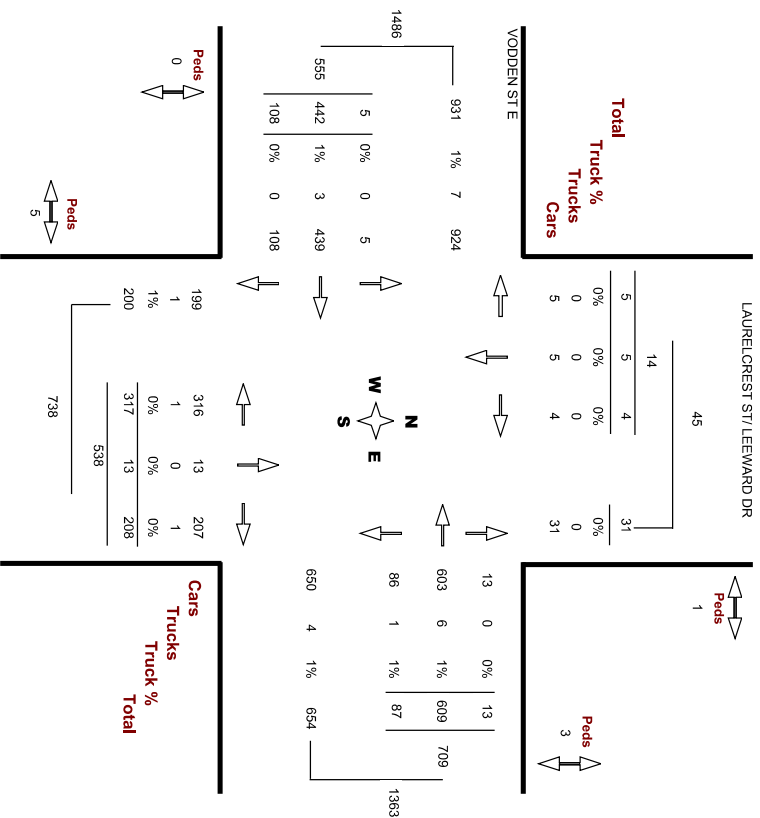
Turning Movements Report - AM Period

Location:..... LAURELCREST ST/LEEWARD DR @ VODDEN ST E
 GeolD:..... 706
 Municipality: Brampton
 Count Date: Wednesday, 11 October, 2017
 Traffic Cont: Traffic signal
 Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... None
 Peak Hour:.. 07:30 AM — 08:30 AM



Turning Movements Report - PM Period

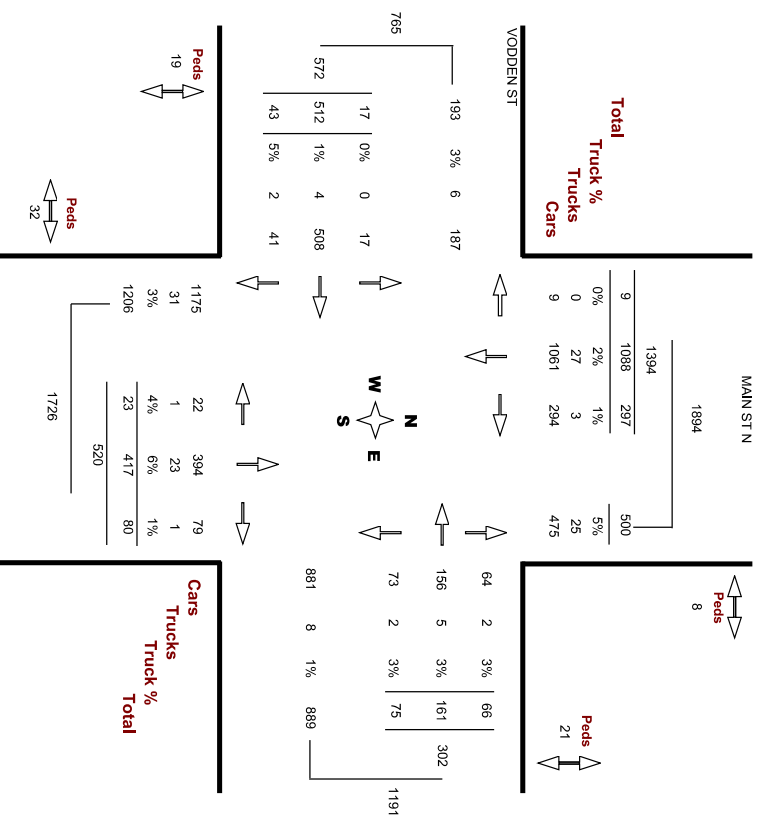
Location:..... LAURELCREST ST/LEEWARD DR @ VODDEN ST E
 GeolD:..... 706
 Municipality: Brampton
 Count Date: Wednesday, 11 October, 2017
 Traffic Cont: Traffic signal
 Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... None
 Peak Hour:.. 04:45 PM — 05:45 PM





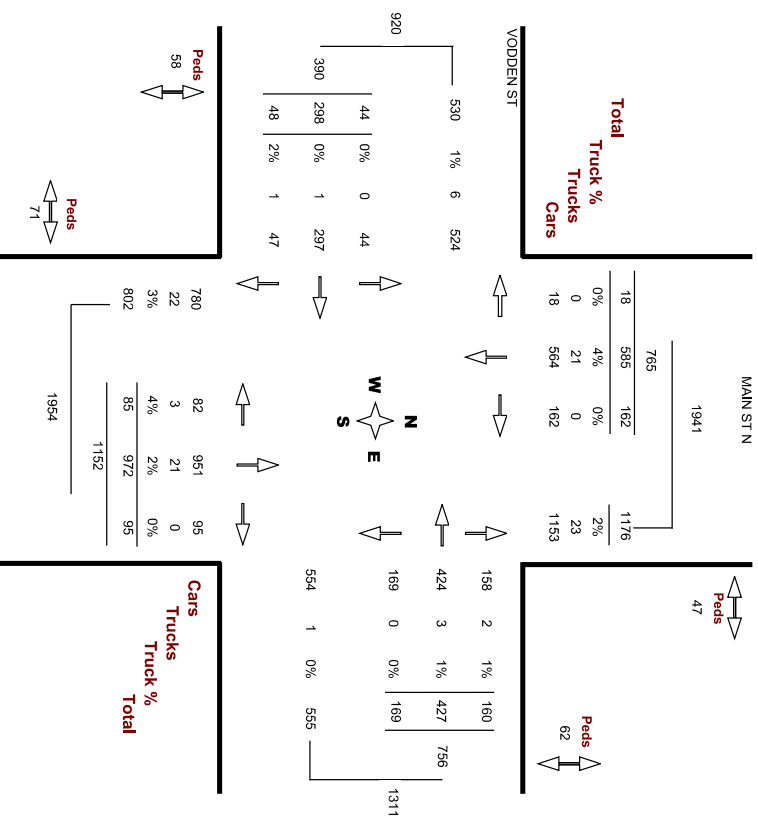
Turning Movements Report - AM Period

Location:..... MAIN ST N @ VODDEN ST GeolD..... 2821
 Municipality: Brampton Count Date. Monday, 31 December, 2018
 Traffic Cont. Traffic signal Count Time. 07:00 AM — 09:00 AM
 Major Dir..... None Peak Hour.. 07:30 AM — 08:30 AM



Turning Movements Report - PM Period

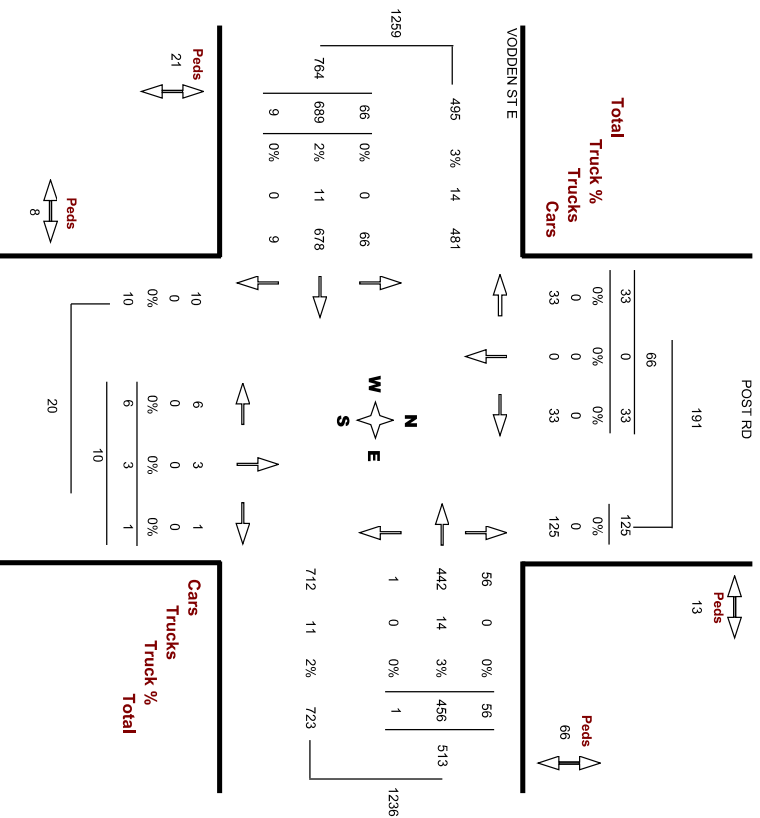
Location:..... MAIN ST N @ VODDEN ST GeolD..... 2821
 Municipality: Brampton Count Date. Monday, 31 December, 2018
 Traffic Cont. Traffic signal Count Time. 03:00 PM — 06:00 PM
 Major Dir..... None Peak Hour.. 04:30 PM — 05:30 PM





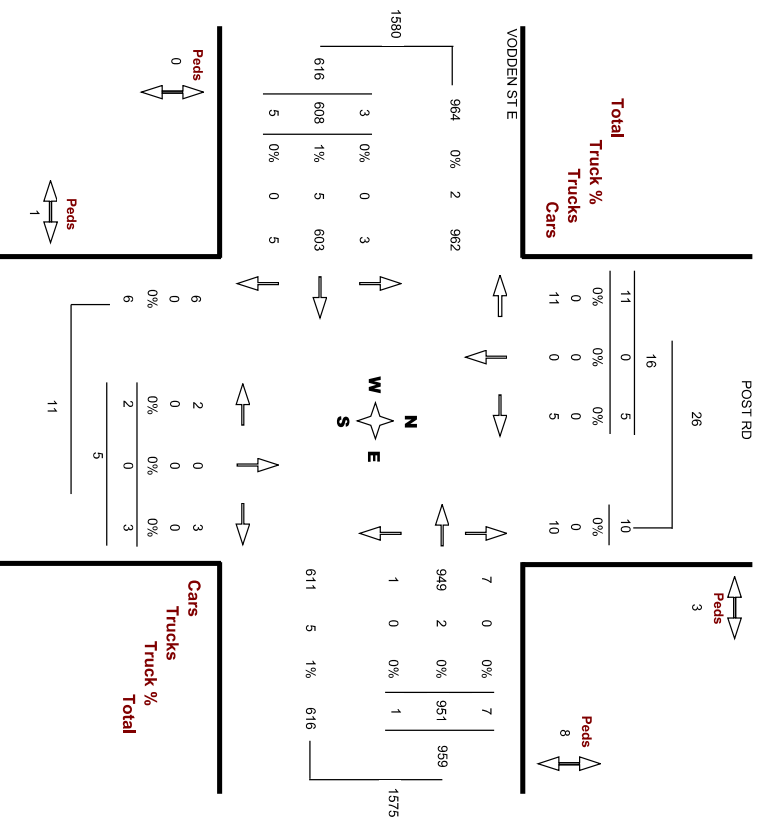
Turning Movements Report - AM Period

Location:..... POST RD @ VODDEN STE GeolD:..... 3616
 Municipality: Brampton Count Date: Tuesday, 04 December, 2018
 Traffic Cont: Traffic signal Count Time: 07:00 AM — 09:00 AM
 Major Dir:..... None Peak Hour: 08:00 AM — 09:00 AM



Turning Movements Report - PM Period

Location:..... POST RD @ VODDEN STE GeolD:..... 3616
 Municipality: Brampton Count Date: Tuesday, 04 December, 2018
 Traffic Cont: Traffic signal Count Time: 03:00 PM — 06:00 PM
 Major Dir:..... None Peak Hour: 04:45 PM — 05:45 PM



Peak Hour Diagram



Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTIONS

Specified Period From: 07:00:00 To: 09:00:00
One Hour Peak From: 08:00:00 To: 09:00:00

Intersection: Rutherford Rd N & Voddan St E
Site ID: 0000002729
Count Date: Feb 25, 2020

Weather conditions:

**** Signalized Intersection ****

Major Road: Voddan St E runs E/W

North Approach

| Out | In | Total |
|------------|------------|------------|
| 610 | 319 | 929 |
| 14 | 16 | 30 |
| 0 | 0 | 0 |
| 624 | 335 | 959 |

Rutherford Rd N

| W | E | T | R |
|------------|------------|-----------|----------|
| 0 | 0 | 0 | 0 |
| 4 | 7 | 3 | 0 |
| 122 | 398 | 89 | 0 |
| 126 | 405 | 92 | 0 |

East Approach

| Out | In | Total |
|------------|------------|-------------|
| 462 | 563 | 1025 |
| 20 | 15 | 35 |
| 0 | 0 | 0 |
| 482 | 578 | 1060 |

Voddan St E

| Totals | Out | In | Total |
|--------|-----|-----|-------|
| 0 | 0 | 0 | 0 |
| 0 | 7 | 167 | 174 |
| 0 | 10 | 456 | 466 |
| 0 | 4 | 190 | 194 |

Peds: 13



Totals

| Out | In | Total |
|-----|-----|-------|
| 0 | 0 | 0 |
| 69 | 68 | 1 |
| 346 | 328 | 18 |
| 67 | 66 | 1 |

West Approach

| Out | In | Total |
|------------|------------|-------------|
| 733 | 516 | 1249 |
| 21 | 29 | 50 |
| 0 | 0 | 0 |
| 754 | 545 | 1299 |

Totals

| W | E | T | R |
|-----------|------------|-----------|----------|
| 66 | 144 | 38 | 0 |
| 7 | 8 | 2 | 0 |
| 0 | 0 | 0 | 0 |
| 73 | 152 | 40 | 0 |

South Approach

| Out | In | Total |
|------------|------------|------------|
| 248 | 655 | 903 |
| 17 | 12 | 29 |
| 0 | 0 | 0 |
| 265 | 667 | 932 |

Cars

Trucks

Bicycles

Comments

Peak Hour Diagram



Ontario Traffic Inc.
TRAFFIC MONITORING SERVICES & PRODUCTIONS

Specified Period From: 15:00:00 To: 18:00:00
One Hour Peak From: 17:00:00 To: 18:00:00

Intersection: Rutherford Rd N & Voddan St E
Site ID: 0000002729
Count Date: Feb 25, 2020

Weather conditions:

**** Signalized Intersection ****

Major Road: Voddan St E runs E/W

North Approach

| Out | In | Total |
|------------|------------|-------------|
| 320 | 768 | 1088 |
| 4 | 5 | 9 |
| 0 | 0 | 0 |
| 324 | 773 | 1097 |

Rutherford Rd N

| W | E | T | R |
|-----------|------------|-----------|----------|
| 0 | 0 | 0 | 0 |
| 1 | 3 | 0 | 0 |
| 81 | 179 | 69 | 0 |
| 82 | 173 | 69 | 0 |

East Approach

| Out | In | Total |
|------------|------------|-------------|
| 819 | 644 | 1463 |
| 5 | 5 | 10 |
| 1 | 0 | 1 |
| 825 | 649 | 1474 |

Voddan St E

| Totals | Out | In | Total |
|--------|-----|-----|-------|
| 0 | 0 | 0 | 0 |
| 0 | 0 | 173 | 173 |
| 0 | 5 | 478 | 483 |
| 0 | 2 | 90 | 92 |

Peds: 1



Totals

| Out | In | Total |
|-----|-----|-------|
| 0 | 0 | 0 |
| 153 | 152 | 1 |
| 604 | 599 | 4 |
| 68 | 68 | 0 |

West Approach

| Out | In | Total |
|------------|------------|-------------|
| 741 | 845 | 1586 |
| 7 | 5 | 12 |
| 0 | 1 | 1 |
| 748 | 851 | 1599 |

Totals

| W | E | T | R |
|------------|------------|-----------|----------|
| 165 | 443 | 97 | 0 |
| 0 | 4 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 165 | 447 | 97 | 0 |

South Approach

| Out | In | Total |
|------------|------------|-------------|
| 705 | 328 | 1033 |
| 4 | 5 | 9 |
| 0 | 0 | 0 |
| 709 | 333 | 1042 |

Cars

Trucks

Bicycles

Comments



Peak Hour Summary

Intersection: Rutherford Rd N & Vodden St E

Count Date: Feb 25, 2020

Period: 07:00 - 09:00

Peak Hour Data (08:00 - 09:00)

| Start Time | North Approach Rutherford Rd N | | | | | South Approach Rutherford Rd N | | | | | East Approach Vodden St E | | | | | West Approach Vodden St E | | | | | Total Vehicles | | | | |
|--------------------|-----------------------------------|-------------|-------------|----------|-------------|-----------------------------------|-------------|-------------|-----------|-------------|------------------------------|-------------|-------------|------------|-------------|------------------------------|-------------|-------------|------------|-------------|-------------------|-------------|-------------|-------------|-------------|
| | ← | ↑ | → | ↻ | Peds | ← | ↑ | → | ↻ | Peds | ← | ↑ | → | ↻ | Peds | ← | ↑ | → | ↻ | Peds | | Total | | | |
| 08:00 | 26 | 184 | 34 | 0 | 5 | 164 | 21 | 22 | 12 | 0 | 5 | 55 | 12 | 76 | 7 | 0 | 1 | 95 | 24 | 140 | 58 | 0 | 5 | 231 | 545 |
| 08:15 | 22 | 36 | 22 | 0 | 8 | 139 | 14 | 36 | 12 | 0 | 1 | 62 | 16 | 79 | 15 | 0 | 2 | 109 | 24 | 93 | 49 | 0 | 1 | 166 | 476 |
| 08:30 | 19 | 142 | 23 | 0 | 13 | 150 | 22 | 42 | 5 | 0 | 12 | 70 | 20 | 95 | 24 | 0 | 10 | 139 | 27 | 112 | 50 | 0 | 2 | 189 | 548 |
| 08:45 | 25 | 105 | 41 | 0 | 19 | 171 | 16 | 52 | 10 | 0 | 13 | 78 | 19 | 97 | 23 | 0 | 24 | 139 | 39 | 92 | 37 | 0 | 4 | 168 | 556 |
| Grand Total | 92 | 406 | 126 | 0 | 45 | 624 | 73 | 152 | 40 | 0 | 31 | 265 | 67 | 346 | 69 | 0 | 37 | 482 | 114 | 446 | 194 | 0 | 13 | 754 | 2125 |
| Approach % | 14.7 | 65.1 | 20.2 | 0 | - | - | 27.5 | 57.4 | 15.1 | 0 | - | - | 13.9 | 71.8 | 14.3 | 0 | - | - | 15.1 | 59.2 | 25.7 | 0 | - | - | - |
| Totals % | 4.3 | 19.1 | 5.9 | 0 | 29.4 | - | 3.4 | 7.2 | 1.9 | 0 | 12.5 | - | 3.2 | 16.3 | 3.2 | 0 | 22.7 | - | 5.4 | 21 | 9.1 | 0 | - | 35.5 | - |
| PHF | 0.88 | 0.97 | 0.77 | 0 | 0.91 | 0.83 | 0.73 | 0.83 | 0 | 0.85 | 0.84 | 0.89 | 0.72 | 0 | 0.87 | 0.73 | 0.75 | 0.84 | 0 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Cars | 89 | 399 | 122 | 0 | 610 | 66 | 144 | 38 | 0 | 248 | 66 | 328 | 68 | 0 | 462 | 107 | 436 | 190 | 0 | 733 | 2053 | 733 | 2053 | 2053 | |
| % Cars | 96.7 | 98.3 | 96.8 | 0 | 97.8 | 90.4 | 94.7 | 95 | 0 | 93.6 | 98.5 | 94.8 | 98.6 | 0 | 95.9 | 93.9 | 97.8 | 97.9 | 0 | 97.2 | 96.6 | 97.2 | 96.6 | 96.6 | |
| Trucks | 3 | 7 | 4 | 0 | 14 | 7 | 8 | 2 | 0 | 17 | 1 | 18 | 1 | 0 | 20 | 7 | 10 | 4 | 0 | 21 | 72 | 21 | 72 | 72 | |
| % Trucks | 3.3 | 1.7 | 3.2 | 0 | 2.2 | 9.6 | 5.3 | 5 | 0 | 6.4 | 1.5 | 5.2 | 1.4 | 0 | 4.1 | 6.1 | 2.2 | 2.1 | 0 | 2.8 | 3.4 | 2.8 | 3.4 | 3.4 | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| % Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Peds | | | | | 45 | - | | | | 31 | - | | | | 37 | - | | | | | 13 | - | | 126 | |
| % Peds | | | | | 35.7 | - | | | | 24.6 | - | | | | 29.4 | - | | | | | 18.3 | - | | 126 | |

Peak Hour Summary

Intersection: Rutherford Rd N & Vodden St E

Count Date: Feb 25, 2020

Period: 15:00 - 18:00

Peak Hour Data (17:00 - 18:00)

| Start Time | North Approach Rutherford Rd N | | | | | South Approach Rutherford Rd N | | | | | East Approach Vodden St E | | | | | West Approach Vodden St E | | | | | Total Vehicles | | | | |
|--------------------|-----------------------------------|-------------|-------------|----------|-------------|-----------------------------------|-------------|-------------|-----------|------------|------------------------------|-------------|-------------|------------|------------|------------------------------|-------------|-------------|------------|-------------|-------------------|-------------|-------------|-------------|-------------|
| | ← | ↑ | → | ↻ | Peds | ← | ↑ | → | ↻ | Peds | ← | ↑ | → | ↻ | Peds | ← | ↑ | → | ↻ | Peds | | Total | | | |
| 17:00 | 8 | 47 | 23 | 0 | 1 | 78 | 36 | 101 | 21 | 0 | 2 | 158 | 18 | 165 | 46 | 0 | 3 | 229 | 44 | 120 | 30 | 0 | 0 | 194 | 659 |
| 17:15 | 15 | 36 | 14 | 0 | 1 | 67 | 52 | 123 | 21 | 0 | 7 | 197 | 16 | 157 | 52 | 0 | 5 | 207 | 45 | 106 | 24 | 0 | 0 | 179 | 650 |
| 17:30 | 18 | 36 | 22 | 0 | 0 | 78 | 42 | 116 | 25 | 0 | 1 | 183 | 16 | 147 | 36 | 0 | 0 | 199 | 41 | 135 | 21 | 0 | 1 | 197 | 657 |
| 17:45 | 28 | 50 | 23 | 0 | 3 | 101 | 34 | 107 | 30 | 0 | 8 | 171 | 16 | 135 | 39 | 0 | 3 | 190 | 39 | 122 | 17 | 0 | 0 | 178 | 640 |
| Grand Total | 69 | 173 | 82 | 0 | 5 | 324 | 165 | 447 | 97 | 0 | 18 | 709 | 68 | 604 | 153 | 0 | 11 | 825 | 173 | 483 | 92 | 0 | 1 | 748 | 2606 |
| Approach % | 21.3 | 53.4 | 25.3 | 0 | - | - | 23.3 | 63 | 13.7 | 0 | - | - | 8.2 | 73.2 | 18.5 | 0 | - | - | 23.1 | 64.6 | 12.3 | 0 | - | - | - |
| Totals % | 2.6 | 6.6 | 3.1 | 0 | 12.4 | - | 6.3 | 17.2 | 3.7 | 0 | 27.2 | - | 2.6 | 23.2 | 5.9 | 0 | 31.7 | - | 6.6 | 18.5 | 3.5 | 0 | - | 28.7 | - |
| PHF | 0.62 | 0.87 | 0.89 | 0 | 0.88 | 0.78 | 0.91 | 0.81 | 0 | 0.9 | 0.94 | 0.92 | 0.83 | 0 | 0.9 | 0.88 | 0.89 | 0.77 | 0 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | |
| Cars | 69 | 170 | 81 | 0 | 320 | 165 | 443 | 97 | 0 | 705 | 68 | 599 | 152 | 0 | 819 | 173 | 478 | 90 | 0 | 741 | 2585 | 741 | 2585 | | |
| % Cars | 100 | 98.3 | 98.8 | 0 | 98.8 | 100 | 99.1 | 100 | 0 | 99.4 | 100 | 99.2 | 99.3 | 0 | 99.3 | 100 | 99 | 97.8 | 0 | 99.1 | 99.2 | 99.1 | 99.2 | 99.2 | |
| Trucks | 0 | 3 | 1 | 0 | 4 | 0 | 4 | 0 | 0 | 4 | 0 | 4 | 1 | 0 | 5 | 0 | 5 | 2 | 0 | 7 | 20 | 7 | 20 | 20 | |
| % Trucks | 0 | 1.7 | 1.2 | 0 | 1.2 | 0 | 0.9 | 0 | 0 | 0.6 | 0 | 0.7 | 0.7 | 0 | 0.6 | 0 | 1 | 2.2 | 0 | 0.9 | 0.8 | 0.9 | 0.8 | 0.8 | |
| Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| % Bicycles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Peds | | | | | 5 | - | | | | 18 | - | | | | 11 | - | | | | | 1 | - | | 35 | |
| % Peds | | | | | 14.3 | - | | | | 5.14 | - | | | | 3.14 | - | | | | | 2.9 | - | | 35 | |

APPENDIX

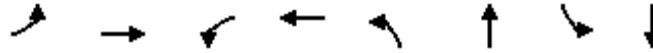
B EXISTING CONDITIONS SYNCHRO REPORTS

Timings

<Existing>AM

1: Main Street & Vodden Street West/Vodden Street East

06-01-2020



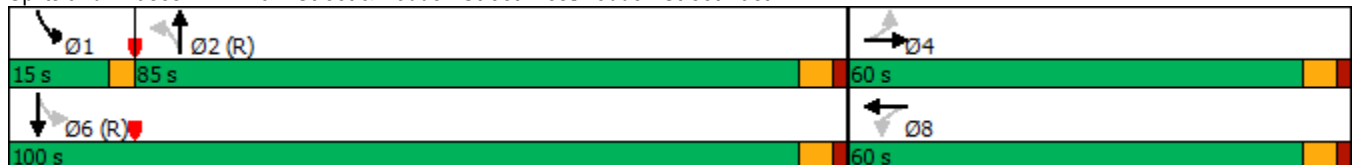
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ |
| Traffic Volume (vph) | 17 | 512 | 75 | 161 | 23 | 417 | 297 | 1088 |
| Future Volume (vph) | 17 | 512 | 75 | 161 | 23 | 417 | 297 | 1088 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | pm+pt | NA |
| Protected Phases | | 4 | | 8 | | 2 | 1 | 6 |
| Permitted Phases | 4 | | 8 | | 2 | | 6 | |
| Detector Phase | 4 | 4 | 8 | 8 | 2 | 2 | 1 | 6 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 |
| Minimum Split (s) | 25.0 | 25.0 | 25.0 | 25.0 | 27.0 | 27.0 | 9.0 | 27.0 |
| Total Split (s) | 60.0 | 60.0 | 60.0 | 60.0 | 85.0 | 85.0 | 15.0 | 100.0 |
| Total Split (%) | 37.5% | 37.5% | 37.5% | 37.5% | 53.1% | 53.1% | 9.4% | 62.5% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 3.0 | 6.0 |
| Lead/Lag | | | | | Lag | Lag | Lead | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | C-Max | C-Max | None | C-Max |
| Act Effct Green (s) | 37.4 | 37.4 | 37.4 | 37.4 | 96.0 | 96.0 | 113.6 | 110.6 |
| Actuated g/C Ratio | 0.23 | 0.23 | 0.23 | 0.23 | 0.60 | 0.60 | 0.71 | 0.69 |
| v/c Ratio | 0.11 | 0.73 | 1.01 | 0.59 | 0.11 | 0.27 | 0.54 | 0.49 |
| Control Delay | 46.1 | 61.0 | 163.1 | 56.1 | 18.0 | 16.1 | 13.2 | 13.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 46.1 | 61.0 | 163.1 | 56.1 | 18.0 | 16.1 | 13.2 | 13.2 |
| LOS | D | E | F | E | B | B | B | B |
| Approach Delay | | 60.6 | | 82.8 | | 16.2 | | 13.2 |
| Approach LOS | | E | | F | | B | | B |

Intersection Summary

Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 69 (43%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.01
 Intersection Signal Delay: 31.0
 Intersection Capacity Utilization 79.5%
 Analysis Period (min) 15

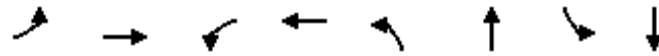
Intersection LOS: C
 ICU Level of Service D

Splits and Phases: 1: Main Street & Vodden Street West/Vodden Street East



1: Main Street & Vodden Street West/Vodden Street East

06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|-------|-------|------|-------|------|-------|
| Lane Group Flow (vph) | 18 | 604 | 82 | 247 | 25 | 540 | 323 | 1193 |
| v/c Ratio | 0.11 | 0.73 | 1.01 | 0.59 | 0.11 | 0.27 | 0.54 | 0.49 |
| Control Delay | 46.1 | 61.0 | 163.1 | 56.1 | 18.0 | 16.1 | 13.2 | 13.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 46.1 | 61.0 | 163.1 | 56.1 | 18.0 | 16.1 | 13.2 | 13.2 |
| Queue Length 50th (m) | 4.6 | 94.3 | ~28.0 | 67.1 | 3.3 | 39.5 | 33.0 | 84.8 |
| Queue Length 95th (m) | 10.8 | 103.5 | #55.6 | 86.7 | 10.1 | 61.2 | 60.7 | 129.3 |
| Internal Link Dist (m) | | 98.5 | | 228.5 | | 261.4 | | 232.7 |
| Turn Bay Length (m) | 42.0 | | | | 48.5 | | 22.5 | |
| Base Capacity (vph) | 243 | 1189 | 117 | 599 | 236 | 1977 | 602 | 2445 |
| 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 | 0.07 | 0.51 | 0.70 | 0.41 | 0.11 | 0.27 | 0.54 | 0.49 |

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
 1: Main Street & Vodden Street West/Vodden Street East

<Existing>AM
 06-01-2020

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  | |  |  | |  |  | |  |  | |
| Traffic Volume (vph) | 17 | 512 | 43 | 75 | 161 | 66 | 23 | 417 | 80 | 297 | 1088 | 9 |
| Future Volume (vph) | 17 | 512 | 43 | 75 | 161 | 66 | 23 | 417 | 80 | 297 | 1088 | 9 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | |
| Fr | 1.00 | 0.99 | | 1.00 | 0.96 | | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1768 | 3514 | | 1733 | 1750 | | 1680 | 3282 | | 1738 | 3538 | |
| Flt Permitted | 0.39 | 1.00 | | 0.19 | 1.00 | | 0.22 | 1.00 | | 0.41 | 1.00 | |
| Satd. Flow (perm) | 721 | 3514 | | 353 | 1750 | | 392 | 3282 | | 750 | 3538 | |
| 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) | 18 | 557 | 47 | 82 | 175 | 72 | 25 | 453 | 87 | 323 | 1183 | 10 |
| RTOR Reduction (vph) | 0 | 5 | 0 | 0 | 11 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 18 | 599 | 0 | 82 | 236 | 0 | 25 | 532 | 0 | 323 | 1193 | 0 |
| Confl. Peds. (#/hr) | 8 | | 32 | 32 | | 8 | 19 | | 21 | 21 | | 19 |
| Heavy Vehicles (%) | 0% | 1% | 5% | 3% | 4% | 4% | 5% | 6% | 2% | 2% | 3% | 0% |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | pm+pt | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | 37.4 | 37.4 | | 37.4 | 37.4 | | 96.0 | 96.0 | | 110.6 | 110.6 | |
| Effective Green, g (s) | 37.4 | 37.4 | | 37.4 | 37.4 | | 96.0 | 96.0 | | 110.6 | 110.6 | |
| Actuated g/C Ratio | 0.23 | 0.23 | | 0.23 | 0.23 | | 0.60 | 0.60 | | 0.69 | 0.69 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 168 | 821 | | 82 | 409 | | 235 | 1969 | | 590 | 2445 | |
| v/s Ratio Prot | | 0.17 | | | 0.14 | | | 0.16 | | c0.04 | 0.34 | |
| v/s Ratio Perm | 0.02 | | | c0.23 | | | 0.06 | | | c0.34 | | |
| v/c Ratio | 0.11 | 0.73 | | 1.00 | 0.58 | | 0.11 | 0.27 | | 0.55 | 0.49 | |
| Uniform Delay, d1 | 48.2 | 56.6 | | 61.3 | 54.3 | | 13.7 | 15.3 | | 9.8 | 11.5 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.6 | 4.1 | | 99.4 | 3.1 | | 0.9 | 0.3 | | 1.0 | 0.7 | |
| Delay (s) | 48.8 | 60.7 | | 160.7 | 57.4 | | 14.6 | 15.6 | | 10.8 | 12.2 | |
| Level of Service | D | E | | F | E | | B | B | | B | B | |
| Approach Delay (s) | | 60.4 | | | 83.2 | | | 15.6 | | | 11.9 | |
| Approach LOS | | E | | | F | | | B | | | B | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 30.3 | | | | | | | | | C |
| HCM 2000 Volume to Capacity ratio | | | 0.67 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 160.0 | | | | | | | 15.0 | | |
| Intersection Capacity Utilization | | | 79.5% | | | | | | | | | D |
| Analysis Period (min) | | | 15 | | | | | | | | | |

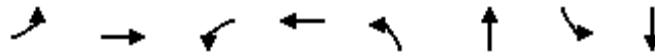
c Critical Lane Group

Timings

<Existing>AM

2: Ken Whillans Drive/Private Access & Vodden Street East

06-01-2020



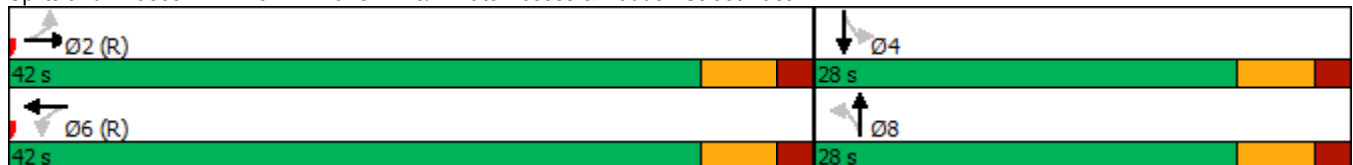
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↔↔ | | ↔↔ | ↔ | ↔ | | ↔↔ |
| Traffic Volume (vph) | 39 | 550 | 64 | 374 | 18 | 1 | 11 | 6 |
| Future Volume (vph) | 39 | 550 | 64 | 374 | 18 | 1 | 11 | 6 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 2 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 26.0 | 26.0 | 26.0 | 26.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 42.0 | 42.0 | 42.0 | 42.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (%) | 60.0% | 60.0% | 60.0% | 60.0% | 40.0% | 40.0% | 40.0% | 40.0% |
| 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | | 57.1 | | 57.1 | 8.9 | 8.9 | | 8.9 |
| Actuated g/C Ratio | | 0.82 | | 0.82 | 0.13 | 0.13 | | 0.13 |
| v/c Ratio | | 0.28 | | 0.23 | 0.12 | 0.20 | | 0.11 |
| Control Delay | | 3.4 | | 2.3 | 28.2 | 11.7 | | 16.5 |
| Queue Delay | | 0.0 | | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | | 3.4 | | 2.3 | 28.2 | 11.7 | | 16.5 |
| LOS | | A | | A | C | B | | B |
| Approach Delay | | 3.4 | | 2.3 | | 16.7 | | 16.5 |
| Approach LOS | | A | | A | | B | | B |

Intersection Summary

Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 19 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.28
 Intersection Signal Delay: 4.1
 Intersection Capacity Utilization 60.5%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service B

Splits and Phases: 2: Ken Whillans Drive/Private Access & Vodden Street East





| Lane Group | EBT | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|------|------|------|
| Lane Group Flow (vph) | 698 | 517 | 20 | 46 | 44 |
| v/c Ratio | 0.28 | 0.23 | 0.12 | 0.20 | 0.11 |
| Control Delay | 3.4 | 2.3 | 28.2 | 11.7 | 16.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 3.4 | 2.3 | 28.2 | 11.7 | 16.5 |
| Queue Length 50th (m) | 14.0 | 10.4 | 2.4 | 0.1 | 1.1 |
| Queue Length 95th (m) | 23.1 | 12.5 | 7.8 | 8.0 | 5.2 |
| Internal Link Dist (m) | 228.5 | 397.8 | | 93.7 | 45.6 |
| Turn Bay Length (m) | | | 29.0 | | |
| Base Capacity (vph) | 2538 | 2222 | 412 | 510 | 920 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.28 | 0.23 | 0.05 | 0.09 | 0.05 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis
2: Ken Whillans Drive/Private Access & Vodden Street East

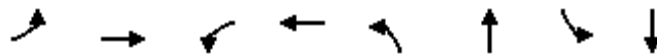
<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|------|------|------|------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | ↕ | ↕ | | | ↕↕ | |
| Traffic Volume (vph) | 39 | 550 | 53 | 64 | 374 | 37 | 18 | 1 | 41 | 11 | 6 | 23 |
| Future Volume (vph) | 39 | 550 | 53 | 64 | 374 | 37 | 18 | 1 | 41 | 11 | 6 | 23 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | 1.00 | 1.00 | | | 0.95 | |
| Frpb, ped/bikes | | 1.00 | | | 1.00 | | 1.00 | 0.98 | | | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Frt | | 0.99 | | | 0.99 | | 1.00 | 0.85 | | | 0.91 | |
| Flt Protected | | 1.00 | | | 0.99 | | 0.95 | 1.00 | | | 0.99 | |
| Satd. Flow (prot) | | 3440 | | | 3408 | | 1717 | 1528 | | | 3257 | |
| Flt Permitted | | 0.90 | | | 0.79 | | 0.73 | 1.00 | | | 0.87 | |
| Satd. Flow (perm) | | 3106 | | | 2721 | | 1314 | 1528 | | | 2871 | |
| 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 | 598 | 58 | 70 | 407 | 40 | 20 | 1 | 45 | 12 | 7 | 25 |
| RTOR Reduction (vph) | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 41 | 0 | 0 | 23 | 0 |
| Lane Group Flow (vph) | 0 | 693 | 0 | 0 | 512 | 0 | 20 | 5 | 0 | 0 | 21 | 0 |
| Confl. Peds. (#/hr) | 18 | | 12 | 12 | | 18 | 3 | | 11 | 11 | | 3 |
| Heavy Vehicles (%) | 0% | 4% | 2% | 2% | 5% | 0% | 6% | 0% | 5% | 0% | 0% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | | 52.3 | | | 52.3 | | 5.7 | 5.7 | | | 5.7 | |
| Effective Green, g (s) | | 52.3 | | | 52.3 | | 5.7 | 5.7 | | | 5.7 | |
| Actuated g/C Ratio | | 0.75 | | | 0.75 | | 0.08 | 0.08 | | | 0.08 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | | 2320 | | | 2032 | | 106 | 124 | | | 233 | |
| v/s Ratio Prot | | | | | | | | 0.00 | | | | |
| v/s Ratio Perm | | c0.22 | | | 0.19 | | c0.02 | | | | 0.01 | |
| v/c Ratio | | 0.30 | | | 0.25 | | 0.19 | 0.04 | | | 0.09 | |
| Uniform Delay, d1 | | 2.9 | | | 2.8 | | 30.0 | 29.6 | | | 29.8 | |
| Progression Factor | | 1.00 | | | 0.74 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | | 0.3 | | | 0.3 | | 1.8 | 0.3 | | | 0.4 | |
| Delay (s) | | 3.2 | | | 2.3 | | 31.8 | 29.9 | | | 30.1 | |
| Level of Service | | A | | | A | | C | C | | | C | |
| Approach Delay (s) | | 3.2 | | | 2.3 | | 30.5 | | | | 30.1 | |
| Approach LOS | | A | | | A | | C | | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 5.1 | | | | HCM 2000 Level of Service | | | A | | |
| HCM 2000 Volume to Capacity ratio | | | 0.29 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 70.0 | | | | Sum of lost time (s) | | 12.0 | | | |
| Intersection Capacity Utilization | | | 60.5% | | | | ICU Level of Service | | | B | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings
3: Centre Street North & Vodden Street East

<Existing>AM
06-01-2020

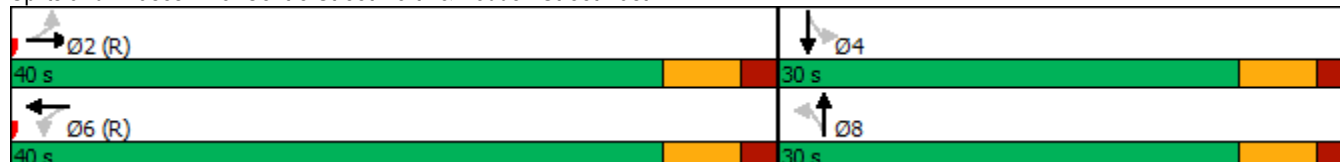


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↵ | ↕↗ | ↵ | ↕↗ | ↵ | ↕↗ | ↵ | ↕↗ |
| Traffic Volume (vph) | 72 | 635 | 78 | 369 | 54 | 116 | 78 | 248 |
| Future Volume (vph) | 72 | 635 | 78 | 369 | 54 | 116 | 78 | 248 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 2 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 28.0 | 28.0 | 28.0 | 28.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| Total Split (s) | 40.0 | 40.0 | 40.0 | 40.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 57.1% | 57.1% | 57.1% | 57.1% | 42.9% | 42.9% | 42.9% | 42.9% |
| 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? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 43.5 | 43.5 | 43.5 | 43.5 | 14.5 | 14.5 | 14.5 | 14.5 |
| Actuated g/C Ratio | 0.62 | 0.62 | 0.62 | 0.62 | 0.21 | 0.21 | 0.21 | 0.21 |
| v/c Ratio | 0.14 | 0.39 | 0.24 | 0.22 | 0.30 | 0.56 | 0.42 | 0.48 |
| Control Delay | 9.1 | 9.1 | 4.6 | 2.7 | 26.1 | 22.5 | 29.4 | 20.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 9.1 | 9.1 | 4.6 | 2.7 | 26.1 | 22.5 | 29.4 | 20.4 |
| LOS | A | A | A | A | C | C | C | C |
| Approach Delay | | 9.1 | | 3.0 | | 23.3 | | 22.1 |
| Approach LOS | | A | | A | | C | | C |

Intersection Summary

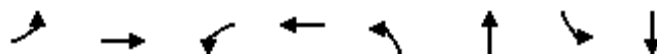
Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 64 (91%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.56
 Intersection Signal Delay: 12.1
 Intersection Capacity Utilization 68.9%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 3: Centre Street North & Vodden Street East



Queues
3: Centre Street North & Vodden Street East

<Existing>AM
06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|-----------------------------|------|-------|------|-------|------|-------|------|-------|
| Lane Group Flow (vph) | 78 | 839 | 85 | 461 | 59 | 225 | 85 | 366 |
| v/c Ratio | 0.14 | 0.39 | 0.24 | 0.22 | 0.30 | 0.56 | 0.42 | 0.48 |
| Control Delay | 9.1 | 9.1 | 4.6 | 2.7 | 26.1 | 22.5 | 29.4 | 20.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 9.1 | 9.1 | 4.6 | 2.7 | 26.1 | 22.5 | 29.4 | 20.4 |
| Queue Length 50th (m) | 5.1 | 32.5 | 2.6 | 6.6 | 6.6 | 19.1 | 9.8 | 17.4 |
| Queue Length 95th (m) | 14.2 | 53.9 | 4.0 | 7.0 | 14.5 | 34.2 | 19.7 | 25.5 |
| Internal Link Dist (m) | | 397.8 | | 166.8 | | 100.6 | | 129.3 |
| Turn Bay Length (m) | 47.0 | | 59.5 | | 44.0 | | 35.5 | |
| Base Capacity (vph) | 539 | 2153 | 361 | 2135 | 321 | 628 | 333 | 1222 |
| 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 | 0.14 | 0.39 | 0.24 | 0.22 | 0.18 | 0.36 | 0.26 | 0.30 |
| Intersection Summary | | | | | | | | |

HCM Signalized Intersection Capacity Analysis
3: Centre Street North & Vodden Street East

<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|-------|------|------|------|------|------|-------|------|------|------|------|
| Lane Configurations | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | |
| Traffic Volume (vph) | 72 | 635 | 137 | 78 | 369 | 55 | 54 | 116 | 91 | 78 | 248 | 88 |
| Future Volume (vph) | 72 | 635 | 137 | 78 | 369 | 55 | 54 | 116 | 91 | 78 | 248 | 88 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| 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 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.97 | | 1.00 | 0.98 | | 1.00 | 0.93 | | 1.00 | 0.96 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1694 | 3437 | | 1747 | 3419 | | 1747 | 1717 | | 1725 | 3417 | |
| Flt Permitted | 0.49 | 1.00 | | 0.32 | 1.00 | | 0.51 | 1.00 | | 0.54 | 1.00 | |
| Satd. Flow (perm) | 868 | 3437 | | 581 | 3419 | | 937 | 1717 | | 973 | 3417 | |
| 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 | 690 | 149 | 85 | 401 | 60 | 59 | 126 | 99 | 85 | 270 | 96 |
| RTOR Reduction (vph) | 0 | 19 | 0 | 0 | 12 | 0 | 0 | 48 | 0 | 0 | 61 | 0 |
| Lane Group Flow (vph) | 78 | 820 | 0 | 85 | 449 | 0 | 59 | 177 | 0 | 85 | 305 | 0 |
| Confl. Peds. (#/hr) | 4 | | 6 | 6 | | 4 | 3 | | 7 | 7 | | 3 |
| Heavy Vehicles (%) | 5% | 3% | 1% | 2% | 3% | 10% | 2% | 5% | 2% | 3% | 3% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 43.5 | 43.5 | | 43.5 | 43.5 | | 14.5 | 14.5 | | 14.5 | 14.5 | |
| Effective Green, g (s) | 43.5 | 43.5 | | 43.5 | 43.5 | | 14.5 | 14.5 | | 14.5 | 14.5 | |
| Actuated g/C Ratio | 0.62 | 0.62 | | 0.62 | 0.62 | | 0.21 | 0.21 | | 0.21 | 0.21 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 539 | 2135 | | 361 | 2124 | | 194 | 355 | | 201 | 707 | |
| v/s Ratio Prot | | c0.24 | | | 0.13 | | | c0.10 | | | 0.09 | |
| v/s Ratio Perm | 0.09 | | | 0.15 | | | 0.06 | | | 0.09 | | |
| v/c Ratio | 0.14 | 0.38 | | 0.24 | 0.21 | | 0.30 | 0.50 | | 0.42 | 0.43 | |
| Uniform Delay, d1 | 5.5 | 6.6 | | 5.9 | 5.8 | | 23.5 | 24.5 | | 24.1 | 24.2 | |
| Progression Factor | 1.21 | 1.23 | | 0.42 | 0.42 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.6 | 0.5 | | 1.5 | 0.2 | | 1.9 | 2.3 | | 3.0 | 0.9 | |
| Delay (s) | 7.2 | 8.6 | | 4.0 | 2.7 | | 25.3 | 26.8 | | 27.1 | 25.0 | |
| Level of Service | A | A | | A | A | | C | C | | C | C | |
| Approach Delay (s) | | 8.5 | | | 2.9 | | | 26.5 | | | 25.4 | |
| Approach LOS | | A | | | A | | | C | | | C | |

| Intersection Summary | | |
|-----------------------------------|-------|---------------------------|
| HCM 2000 Control Delay | 12.9 | HCM 2000 Level of Service |
| HCM 2000 Volume to Capacity ratio | 0.41 | B |
| Actuated Cycle Length (s) | 70.0 | Sum of lost time (s) |
| Intersection Capacity Utilization | 68.9% | 12.0 |
| Analysis Period (min) | 15 | ICU Level of Service |
| | | C |

c Critical Lane Group

Timings
4: Post Road/School Access & Vodden Street East

<Existing>AM
06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↕↕ | | ↕↕ | | ↕↕ | | ↑ | ↗ |
| Traffic Volume (vph) | 66 | 689 | 1 | 456 | 6 | 3 | 33 | 0 | 33 |
| Future Volume (vph) | 66 | 689 | 1 | 456 | 6 | 3 | 33 | 0 | 33 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | 2 | | 4 | | 4 | |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | | 4 |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 |
| Total Split (s) | 43.0 | 43.0 | 43.0 | 43.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (%) | 61.4% | 61.4% | 61.4% | 61.4% | 38.6% | 38.6% | 38.6% | 38.6% | 38.6% |
| Yellow Time (s) | 4.0 | 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 | 2.0 |
| Lost Time Adjust (s) | | 0.0 | | 0.0 | | 0.0 | | 0.0 | 0.0 |
| Total Lost Time (s) | | 6.0 | | 6.0 | | 6.0 | | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | | 56.5 | | 56.5 | | 9.6 | | 9.6 | 9.6 |
| Actuated g/C Ratio | | 0.81 | | 0.81 | | 0.14 | | 0.14 | 0.14 |
| v/c Ratio | | 0.34 | | 0.21 | | 0.06 | | 0.20 | 0.14 |
| Control Delay | | 2.0 | | 2.9 | | 24.8 | | 28.7 | 8.2 |
| Queue Delay | | 0.0 | | 0.0 | | 0.0 | | 0.0 | 0.0 |
| Total Delay | | 2.0 | | 2.9 | | 24.8 | | 28.7 | 8.2 |
| LOS | | A | | A | | C | | C | A |
| Approach Delay | | 2.0 | | 2.9 | | 24.8 | | 18.5 | |
| Approach LOS | | A | | A | | C | | B | |

Intersection Summary

| | |
|---|------------------------|
| Cycle Length: 70 | |
| Actuated Cycle Length: 70 | |
| Offset: 59 (84%), Referenced to phase 2:EBWB and 6:, Start of Green | |
| Natural Cycle: 55 | |
| Control Type: Actuated-Coordinated | |
| Maximum v/c Ratio: 0.34 | |
| Intersection Signal Delay: 3.4 | Intersection LOS: A |
| Intersection Capacity Utilization 68.5% | ICU Level of Service C |
| Analysis Period (min) 15 | |

Splits and Phases: 4: Post Road/School Access & Vodden Street East





| Lane Group | EBT | WBT | NBT | SBT | SBR |
|------------------------|-------|-------|-------|------|------|
| Lane Group Flow (vph) | 831 | 558 | 11 | 36 | 36 |
| v/c Ratio | 0.34 | 0.21 | 0.06 | 0.20 | 0.14 |
| Control Delay | 2.0 | 2.9 | 24.8 | 28.7 | 8.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 2.0 | 2.9 | 24.8 | 28.7 | 8.2 |
| Queue Length 50th (m) | 8.5 | 4.3 | 1.2 | 4.3 | 0.0 |
| Queue Length 95th (m) | 12.5 | 16.4 | 5.0 | 11.4 | 5.6 |
| Internal Link Dist (m) | 166.8 | 488.5 | 114.7 | 40.1 | |
| Turn Bay Length (m) | | | | | |
| Base Capacity (vph) | 2449 | 2651 | 438 | 402 | 495 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.34 | 0.21 | 0.03 | 0.09 | 0.07 |
| Intersection Summary | | | | | |

HCM Signalized Intersection Capacity Analysis
4: Post Road/School Access & Vodden Street East

<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|-------|------|------|------|------|------|------|------|------|-------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | | ↕ | | | ↑ | ↗ |
| Traffic Volume (vph) | 66 | 689 | 9 | 1 | 456 | 56 | 6 | 3 | 1 | 33 | 0 | 33 |
| Future Volume (vph) | 66 | 689 | 9 | 1 | 456 | 56 | 6 | 3 | 1 | 33 | 0 | 33 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.5 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 6.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frbp, ped/bikes | | 1.00 | | | 1.00 | | | 0.99 | | | 1.00 | 0.97 |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 0.99 | | | 0.93 | 1.00 |
| Frt | | 1.00 | | | 0.98 | | | 0.99 | | | 1.00 | 0.85 |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.97 | | | 0.95 | 1.00 |
| Satd. Flow (prot) | | 3545 | | | 3437 | | | 1801 | | | 1700 | 1543 |
| Flt Permitted | | 0.85 | | | 0.95 | | | 0.79 | | | 0.75 | 1.00 |
| Satd. Flow (perm) | | 3038 | | | 3280 | | | 1460 | | | 1343 | 1543 |
| 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 | 749 | 10 | 1 | 496 | 61 | 7 | 3 | 1 | 36 | 0 | 36 |
| RTOR Reduction (vph) | 0 | 1 | 0 | 0 | 8 | 0 | 0 | 1 | 0 | 0 | 0 | 33 |
| Lane Group Flow (vph) | 0 | 830 | 0 | 0 | 550 | 0 | 0 | 10 | 0 | 0 | 36 | 3 |
| Confl. Peds. (#/hr) | 13 | | 8 | 8 | | 13 | 21 | | 66 | 66 | | 21 |
| Confl. Bikes (#/hr) | | | 1 | | | | | | | | | |
| Heavy Vehicles (%) | 0% | 2% | 0% | 0% | 4% | 0% | 0% | 0% | 0% | 0% | 2% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | 4 |
| Actuated Green, G (s) | | 51.7 | | | 51.7 | | | 6.3 | | | 6.3 | 6.3 |
| Effective Green, g (s) | | 51.7 | | | 51.7 | | | 6.3 | | | 6.3 | 6.3 |
| Actuated g/C Ratio | | 0.74 | | | 0.74 | | | 0.09 | | | 0.09 | 0.09 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 6.0 |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 5.0 |
| Lane Grp Cap (vph) | | 2243 | | | 2422 | | | 131 | | | 120 | 138 |
| v/s Ratio Prot | | | | | | | | | | | | |
| v/s Ratio Perm | | c0.27 | | | 0.17 | | | 0.01 | | | c0.03 | 0.00 |
| v/c Ratio | | 0.37 | | | 0.23 | | | 0.08 | | | 0.30 | 0.02 |
| Uniform Delay, d1 | | 3.3 | | | 2.9 | | | 29.2 | | | 29.8 | 29.0 |
| Progression Factor | | 0.45 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 0.4 | | | 0.2 | | | 0.5 | | | 2.9 | 0.1 |
| Delay (s) | | 1.9 | | | 2.9 | | | 29.7 | | | 32.7 | 29.2 |
| Level of Service | | A | | | A | | | C | | | C | C |
| Approach Delay (s) | | 1.9 | | | 2.9 | | | 29.7 | | | 31.0 | |
| Approach LOS | | A | | | A | | | C | | | C | |

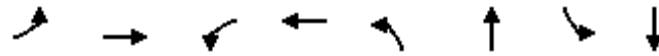
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 3.9 | HCM 2000 Level of Service | A |
| HCM 2000 Volume to Capacity ratio | 0.36 | | |
| Actuated Cycle Length (s) | 70.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 68.5% | ICU Level of Service | C |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
5: Kennedy Road North & Vodden Street East

<Existing>AM
06-01-2020

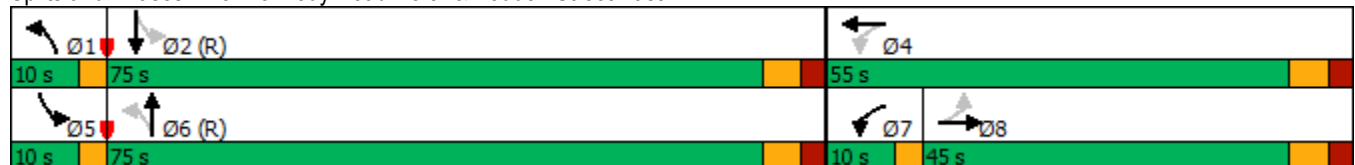


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ |
| Traffic Volume (vph) | 39 | 444 | 131 | 334 | 74 | 398 | 233 | 1081 |
| Future Volume (vph) | 39 | 444 | 131 | 334 | 74 | 398 | 233 | 1081 |
| Turn Type | Perm | NA | pm+pt | NA | pm+pt | NA | pm+pt | NA |
| Protected Phases | | 8 | 7 | 4 | 1 | 6 | 5 | 2 |
| Permitted Phases | 8 | | 4 | | 6 | | 2 | |
| Detector Phase | 8 | 8 | 7 | 4 | 1 | 6 | 5 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 |
| Minimum Split (s) | 40.8 | 40.8 | 8.0 | 40.8 | 8.0 | 39.7 | 8.0 | 39.7 |
| Total Split (s) | 45.0 | 45.0 | 10.0 | 55.0 | 10.0 | 75.0 | 10.0 | 75.0 |
| Total Split (%) | 32.1% | 32.1% | 7.1% | 39.3% | 7.1% | 53.6% | 7.1% | 53.6% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 0.0 | 2.8 | 0.0 | 2.7 | 0.0 | 2.7 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 3.0 | 6.8 | 3.0 | 6.7 | 3.0 | 6.7 |
| Lead/Lag | Lag | Lag | Lead | | Lead | Lag | Lead | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | | Yes | Yes | Yes | Yes |
| Recall Mode | None | None | None | None | None | C-Max | None | C-Max |
| Act Effct Green (s) | 31.5 | 31.5 | 45.3 | 41.5 | 85.2 | 75.0 | 86.2 | 75.5 |
| Actuated g/C Ratio | 0.22 | 0.22 | 0.32 | 0.30 | 0.61 | 0.54 | 0.62 | 0.54 |
| v/c Ratio | 0.20 | 0.75 | 0.76 | 0.43 | 0.37 | 0.30 | 0.48 | 0.67 |
| Control Delay | 49.3 | 58.7 | 61.2 | 38.5 | 16.1 | 18.1 | 16.4 | 26.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 49.3 | 58.7 | 61.2 | 38.5 | 16.1 | 18.1 | 16.4 | 26.5 |
| LOS | D | E | E | D | B | B | B | C |
| Approach Delay | | 58.1 | | 44.0 | | 17.9 | | 24.8 |
| Approach LOS | | E | | D | | B | | C |

Intersection Summary

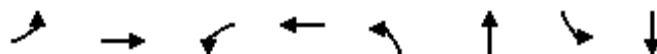
Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 133 (95%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.76
 Intersection Signal Delay: 33.2
 Intersection Capacity Utilization 90.4%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service E

Splits and Phases: 5: Kennedy Road North & Vodden Street East



Queues
5: Kennedy Road North & Vodden Street East

<Existing>AM
06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|-------|-------|------|-------|------|-------|
| Lane Group Flow (vph) | 41 | 577 | 139 | 434 | 79 | 519 | 248 | 1228 |
| v/c Ratio | 0.20 | 0.75 | 0.76 | 0.43 | 0.37 | 0.30 | 0.48 | 0.67 |
| Control Delay | 49.3 | 58.7 | 61.2 | 38.5 | 16.1 | 18.1 | 16.4 | 26.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 49.3 | 58.7 | 61.2 | 38.5 | 16.1 | 18.1 | 16.4 | 26.5 |
| Queue Length 50th (m) | 9.9 | 73.3 | 28.2 | 48.3 | 8.0 | 38.4 | 28.0 | 127.0 |
| Queue Length 95th (m) | 20.7 | 88.2 | #45.6 | 59.7 | 16.6 | 55.3 | 46.8 | 167.3 |
| Internal Link Dist (m) | | 488.5 | | 191.2 | | 129.6 | | 496.7 |
| Turn Bay Length (m) | 52.0 | | 43.5 | | 58.0 | | 79.5 | |
| Base Capacity (vph) | 250 | 931 | 184 | 1166 | 217 | 1756 | 516 | 1822 |
| 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 | 0.16 | 0.62 | 0.76 | 0.37 | 0.36 | 0.30 | 0.48 | 0.67 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Kennedy Road North & Vodden Street East

<Existing>AM
06-01-2020

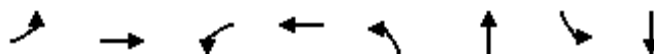


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|-------|------|------|-------|------|------|-------|-------|-----------------------------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 39 | 444 | 99 | 131 | 334 | 74 | 74 | 398 | 90 | 233 | 1081 | 73 |
| Future Volume (vph) | 39 | 444 | 99 | 131 | 334 | 74 | 74 | 398 | 90 | 233 | 1081 | 73 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 0.98 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | |
| Frft | 1.00 | 0.97 | | 1.00 | 0.97 | | 1.00 | 0.97 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1744 | 3364 | | 1698 | 3346 | | 1637 | 3253 | | 1707 | 3373 | |
| Flt Permitted | 0.50 | 1.00 | | 0.21 | 1.00 | | 0.14 | 1.00 | | 0.43 | 1.00 | |
| Satd. Flow (perm) | 917 | 3364 | | 367 | 3346 | | 242 | 3253 | | 767 | 3373 | |
| Peak-hour factor, PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Adj. Flow (vph) | 41 | 472 | 105 | 139 | 355 | 79 | 79 | 423 | 96 | 248 | 1150 | 78 |
| RTOR Reduction (vph) | 0 | 15 | 0 | 0 | 15 | 0 | 0 | 13 | 0 | 0 | 3 | 0 |
| Lane Group Flow (vph) | 41 | 562 | 0 | 139 | 419 | 0 | 79 | 506 | 0 | 248 | 1225 | 0 |
| Confl. Peds. (#/hr) | 34 | | 17 | 17 | | 34 | 31 | | 23 | 23 | | 31 |
| Heavy Vehicles (%) | 0% | 4% | 9% | 5% | 4% | 10% | 9% | 9% | 5% | 4% | 5% | 7% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | pm+pt | NA | | pm+pt | NA | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | 5 | 2 | |
| Permitted Phases | 8 | | | 4 | | | 6 | | | 2 | | |
| Actuated Green, G (s) | 31.5 | 31.5 | | 41.5 | 41.5 | | 81.5 | 75.0 | | 82.5 | 75.5 | |
| Effective Green, g (s) | 31.5 | 31.5 | | 41.5 | 41.5 | | 81.5 | 75.0 | | 82.5 | 75.5 | |
| Actuated g/C Ratio | 0.22 | 0.22 | | 0.30 | 0.30 | | 0.58 | 0.54 | | 0.59 | 0.54 | |
| Clearance Time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 3.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 206 | 756 | | 175 | 991 | | 205 | 1742 | | 498 | 1819 | |
| v/s Ratio Prot | | 0.17 | | c0.04 | 0.13 | | 0.02 | 0.16 | | c0.02 | c0.36 | |
| v/s Ratio Perm | 0.04 | | | c0.20 | | | 0.21 | | | 0.27 | | |
| v/c Ratio | 0.20 | 0.74 | | 0.79 | 0.42 | | 0.39 | 0.29 | | 0.50 | 0.67 | |
| Uniform Delay, d1 | 44.0 | 50.5 | | 42.5 | 39.6 | | 16.6 | 17.9 | | 15.1 | 23.3 | |
| Progression Factor | 1.11 | 1.08 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 1.0 | 4.6 | | 21.5 | 0.6 | | 1.2 | 0.4 | | 0.8 | 2.0 | |
| Delay (s) | 50.0 | 59.3 | | 64.0 | 40.2 | | 17.8 | 18.3 | | 15.9 | 25.3 | |
| Level of Service | D | E | | E | D | | B | B | | B | C | |
| Approach Delay (s) | | 58.7 | | | 46.0 | | | 18.2 | | | 23.8 | |
| Approach LOS | | E | | | D | | | B | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 33.3 | | | | | | | | | HCM 2000 Level of Service C |
| HCM 2000 Volume to Capacity ratio | | | 0.72 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 140.0 | | | | | | | | | Sum of lost time (s) 19.5 |
| Intersection Capacity Utilization | | | 90.4% | | | | | | | | | ICU Level of Service E |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
6: Hansen Road North & Vodden Street East

<Existing>AM
06-01-2020



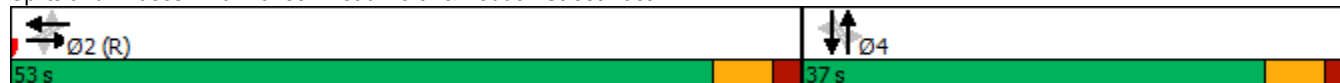
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ |
| Traffic Volume (vph) | 27 | 746 | 65 | 484 | 56 | 47 | 94 | 118 |
| Future Volume (vph) | 27 | 746 | 65 | 484 | 56 | 47 | 94 | 118 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 2 | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 53.0 | 53.0 | 53.0 | 53.0 | 37.0 | 37.0 | 37.0 | 37.0 |
| Total Split (%) | 58.9% | 58.9% | 58.9% | 58.9% | 41.1% | 41.1% | 41.1% | 41.1% |
| 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? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 61.5 | 61.5 | 61.5 | 61.5 | 16.5 | 16.5 | 16.5 | 16.5 |
| Actuated g/C Ratio | 0.68 | 0.68 | 0.68 | 0.68 | 0.18 | 0.18 | 0.18 | 0.18 |
| v/c Ratio | 0.05 | 0.42 | 0.22 | 0.23 | 0.34 | 0.31 | 0.45 | 0.54 |
| Control Delay | 6.5 | 7.3 | 8.3 | 5.0 | 35.1 | 17.3 | 37.5 | 33.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 6.5 | 7.3 | 8.3 | 5.0 | 35.1 | 17.3 | 37.5 | 33.0 |
| LOS | A | A | A | A | D | B | D | C |
| Approach Delay | | 7.3 | | 5.4 | | 23.7 | | 34.6 |
| Approach LOS | | A | | A | | C | | C |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 37 (41%), Referenced to phase 2:EBWB, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.54
 Intersection Signal Delay: 11.8
 Intersection Capacity Utilization 73.9%
 Analysis Period (min) 15

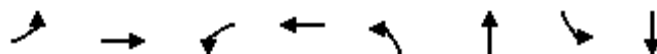
Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 6: Hansen Road North & Vodden Street East



Queues
6: Hansen Road North & Vodden Street East

<Existing>AM
06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|------|-------|------|------|------|------|
| Lane Group Flow (vph) | 29 | 998 | 71 | 555 | 61 | 110 | 102 | 187 |
| v/c Ratio | 0.05 | 0.42 | 0.22 | 0.23 | 0.34 | 0.31 | 0.45 | 0.54 |
| Control Delay | 6.5 | 7.3 | 8.3 | 5.0 | 35.1 | 17.3 | 37.5 | 33.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 6.5 | 7.3 | 8.3 | 5.0 | 35.1 | 17.3 | 37.5 | 33.0 |
| Queue Length 50th (m) | 1.4 | 33.0 | 2.8 | 10.8 | 9.3 | 7.5 | 15.9 | 25.0 |
| Queue Length 95th (m) | 5.3 | 57.2 | 9.0 | 18.4 | 18.8 | 19.2 | 27.9 | 40.7 |
| Internal Link Dist (m) | | 191.2 | | 358.4 | | 69.3 | | 49.9 |
| Turn Bay Length (m) | 28.0 | | 43.0 | | 34.5 | | 24.0 | |
| Base Capacity (vph) | 560 | 2373 | 319 | 2403 | 341 | 608 | 428 | 624 |
| 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 | 0.05 | 0.42 | 0.22 | 0.23 | 0.18 | 0.18 | 0.24 | 0.30 |
| Intersection Summary | | | | | | | | |

HCM Signalized Intersection Capacity Analysis
6: Hansen Road North & Vodden Street East

<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|------|------|------|-------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 27 | 746 | 172 | 65 | 484 | 27 | 56 | 47 | 54 | 94 | 118 | 54 |
| Future Volume (vph) | 27 | 746 | 172 | 65 | 484 | 27 | 56 | 47 | 54 | 94 | 118 | 54 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| 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 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 0.98 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | |
| Frt | 1.00 | 0.97 | | 1.00 | 0.99 | | 1.00 | 0.92 | | 1.00 | 0.95 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1753 | 3453 | | 1709 | 3515 | | 1737 | 1654 | | 1722 | 1759 | |
| Flt Permitted | 0.44 | 1.00 | | 0.26 | 1.00 | | 0.54 | 1.00 | | 0.69 | 1.00 | |
| Satd. Flow (perm) | 820 | 3453 | | 468 | 3515 | | 991 | 1654 | | 1244 | 1759 | |
| 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) | 29 | 811 | 187 | 71 | 526 | 29 | 61 | 51 | 59 | 102 | 128 | 59 |
| RTOR Reduction (vph) | 0 | 15 | 0 | 0 | 3 | 0 | 0 | 48 | 0 | 0 | 23 | 0 |
| Lane Group Flow (vph) | 29 | 983 | 0 | 71 | 552 | 0 | 61 | 62 | 0 | 102 | 164 | 0 |
| Confl. Peds. (#/hr) | 25 | | 12 | 12 | | 25 | 11 | | 8 | 8 | | 11 |
| Heavy Vehicles (%) | 0% | 2% | 2% | 4% | 2% | 8% | 2% | 3% | 8% | 3% | 3% | 4% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | |
| Actuated Green, G (s) | 61.5 | 61.5 | | 61.5 | 61.5 | | 16.5 | 16.5 | | 16.5 | 16.5 | |
| Effective Green, g (s) | 61.5 | 61.5 | | 61.5 | 61.5 | | 16.5 | 16.5 | | 16.5 | 16.5 | |
| Actuated g/C Ratio | 0.68 | 0.68 | | 0.68 | 0.68 | | 0.18 | 0.18 | | 0.18 | 0.18 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 560 | 2359 | | 319 | 2401 | | 181 | 303 | | 228 | 322 | |
| v/s Ratio Prot | | c0.28 | | | 0.16 | | | 0.04 | | | c0.09 | |
| v/s Ratio Perm | 0.04 | | | 0.15 | | | 0.06 | | | 0.08 | | |
| v/c Ratio | 0.05 | 0.42 | | 0.22 | 0.23 | | 0.34 | 0.20 | | 0.45 | 0.51 | |
| Uniform Delay, d1 | 4.7 | 6.3 | | 5.3 | 5.4 | | 32.0 | 31.2 | | 32.7 | 33.1 | |
| Progression Factor | 1.00 | 1.00 | | 0.90 | 0.80 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.2 | 0.5 | | 1.6 | 0.2 | | 2.3 | 0.7 | | 2.9 | 2.6 | |
| Delay (s) | 4.9 | 6.9 | | 6.4 | 4.5 | | 34.3 | 31.9 | | 35.6 | 35.7 | |
| Level of Service | A | A | | A | A | | C | C | | D | D | |
| Approach Delay (s) | | 6.8 | | | 4.7 | | | 32.7 | | | 35.7 | |
| Approach LOS | | A | | | A | | | C | | | D | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 12.2 | | | | HCM 2000 Level of Service | | | B | | |
| HCM 2000 Volume to Capacity ratio | | | 0.44 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | Sum of lost time (s) | | | 12.0 | | |
| Intersection Capacity Utilization | | | 73.9% | | | | ICU Level of Service | | | D | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
7: Rutherford Road North & Vodden Street East

<Existing>AM
06-01-2020

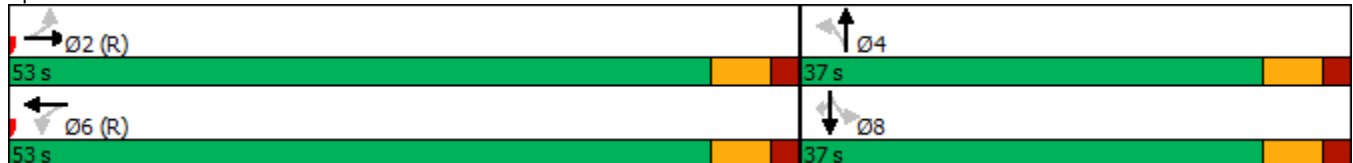


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ |
| Traffic Volume (vph) | 114 | 446 | 67 | 346 | 73 | 152 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 67 | 346 | 73 | 152 | 92 | 406 | 126 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | 6 | | 4 | | 8 | |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | | 8 |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 53.0 | 53.0 | 53.0 | 53.0 | 37.0 | 37.0 | 37.0 | 37.0 | 37.0 |
| Total Split (%) | 58.9% | 58.9% | 58.9% | 58.9% | 41.1% | 41.1% | 41.1% | 41.1% | 41.1% |
| Yellow Time (s) | 4.0 | 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 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 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 | 6.0 |
| Lead/Lag | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 51.0 | 51.0 | 51.0 | 51.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Actuated g/C Ratio | 0.57 | 0.57 | 0.57 | 0.57 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| v/c Ratio | 0.25 | 0.35 | 0.18 | 0.23 | 0.56 | 0.38 | 0.31 | 0.76 | 0.24 |
| Control Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| LOS | B | B | B | B | D | C | C | D | A |
| Approach Delay | | 13.4 | | 11.0 | | 29.1 | | 29.3 | |
| Approach LOS | | B | | B | | C | | C | |

Intersection Summary

| | |
|---|------------------------|
| Cycle Length: 90 | |
| Actuated Cycle Length: 90 | |
| Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green | |
| Natural Cycle: 75 | |
| Control Type: Actuated-Coordinated | |
| Maximum v/c Ratio: 0.76 | |
| Intersection Signal Delay: 19.5 | Intersection LOS: B |
| Intersection Capacity Utilization 80.7% | ICU Level of Service D |
| Analysis Period (min) 15 | |

Splits and Phases: 7: Rutherford Road North & Vodden Street East



Queues

<Existing>AM

7: Rutherford Road North & Vodden Street East

06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|------------------------|------|-------|------|-------|------|-------|------|-------|------|
| Lane Group Flow (vph) | 119 | 667 | 70 | 432 | 76 | 200 | 96 | 423 | 131 |
| v/c Ratio | 0.25 | 0.35 | 0.18 | 0.23 | 0.56 | 0.38 | 0.31 | 0.76 | 0.24 |
| Control Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| Queue Length 50th (m) | 13.2 | 35.5 | 7.3 | 21.9 | 10.7 | 24.1 | 12.4 | 64.1 | 0.1 |
| Queue Length 95th (m) | 27.3 | 51.4 | 17.6 | 35.0 | 25.1 | 40.3 | 24.1 | 92.7 | 11.4 |
| Internal Link Dist (m) | | 358.4 | | 418.5 | | 288.8 | | 340.1 | |
| Turn Bay Length (m) | 50.0 | | 48.5 | | 47.5 | | 41.5 | | 44.5 |
| Base Capacity (vph) | 479 | 1921 | 380 | 1896 | 156 | 602 | 356 | 641 | 601 |
| 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 | 0.25 | 0.35 | 0.18 | 0.23 | 0.49 | 0.33 | 0.27 | 0.66 | 0.22 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis
7: Rutherford Road North & Vodden Street East

<Existing>AM
06-01-2020

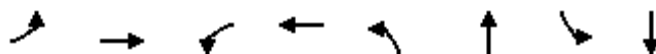


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|----------------------|---------------------------|------|------|------|-------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | ↖ |
| Traffic Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Frpb, ped/bikes | 1.00 | 0.98 | | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 1.00 | 0.98 |
| Flpb, ped/bikes | 0.96 | 1.00 | | 0.98 | 1.00 | | 0.99 | 1.00 | | 0.97 | 1.00 | 1.00 |
| Fr _t | 1.00 | 0.95 | | 1.00 | 0.97 | | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| Fl _t Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1606 | 3302 | | 1720 | 3317 | | 1651 | 1721 | | 1673 | 1861 | 1499 |
| Fl _t Permitted | 0.50 | 1.00 | | 0.37 | 1.00 | | 0.26 | 1.00 | | 0.59 | 1.00 | 1.00 |
| Satd. Flow (perm) | 847 | 3302 | | 672 | 3317 | | 453 | 1721 | | 1036 | 1861 | 1499 |
| Peak-hour factor, PHF | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 |
| Adj. Flow (vph) | 119 | 465 | 202 | 70 | 360 | 72 | 76 | 158 | 42 | 96 | 423 | 131 |
| RTOR Reduction (vph) | 0 | 49 | 0 | 0 | 17 | 0 | 0 | 11 | 0 | 0 | 0 | 91 |
| Lane Group Flow (vph) | 119 | 618 | 0 | 70 | 415 | 0 | 76 | 189 | 0 | 96 | 423 | 40 |
| Confl. Peds. (#/hr) | 45 | | 31 | 31 | | 45 | 13 | | 37 | 37 | | 13 |
| Heavy Vehicles (%) | 7% | 3% | 3% | 2% | 6% | 2% | 10% | 6% | 5% | 4% | 2% | 4% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 3 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 51.0 | 51.0 | | 51.0 | 51.0 | | 27.0 | 27.0 | | 27.0 | 27.0 | 27.0 |
| Effective Green, g (s) | 51.0 | 51.0 | | 51.0 | 51.0 | | 27.0 | 27.0 | | 27.0 | 27.0 | 27.0 |
| Actuated g/C Ratio | 0.57 | 0.57 | | 0.57 | 0.57 | | 0.30 | 0.30 | | 0.30 | 0.30 | 0.30 |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 479 | 1871 | | 380 | 1879 | | 135 | 516 | | 310 | 558 | 449 |
| v/s Ratio Prot | | c0.19 | | | 0.13 | | | 0.11 | | | c0.23 | |
| v/s Ratio Perm | 0.14 | | | 0.10 | | | 0.17 | | | 0.09 | | 0.03 |
| v/c Ratio | 0.25 | 0.33 | | 0.18 | 0.22 | | 0.56 | 0.37 | | 0.31 | 0.76 | 0.09 |
| Uniform Delay, d1 | 9.8 | 10.4 | | 9.4 | 9.7 | | 26.5 | 24.8 | | 24.3 | 28.5 | 22.7 |
| Progression Factor | 1.23 | 1.35 | | 1.06 | 1.09 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.2 | 0.4 | | 1.0 | 0.3 | | 8.6 | 0.9 | | 1.2 | 6.9 | 0.2 |
| Delay (s) | 13.3 | 14.5 | | 11.0 | 10.8 | | 35.1 | 25.7 | | 25.5 | 35.5 | 22.8 |
| Level of Service | B | B | | B | B | | D | C | | C | D | C |
| Approach Delay (s) | | 14.3 | | | 10.8 | | | 28.3 | | | 31.5 | |
| Approach LOS | | B | | | B | | | C | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 20.3 | | | | HCM 2000 Level of Service | | | C | | |
| HCM 2000 Volume to Capacity ratio | | | 0.48 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | Sum of lost time (s) | | | 12.0 | | | |
| Intersection Capacity Utilization | | | 80.7% | | | ICU Level of Service | | | D | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
8: Archdekin Drive & Vodden Street East

<Existing>AM
06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↕↕ | | ↕↕ | | ↕↕ | | ↕↕ |
| Traffic Volume (vph) | 30 | 524 | 59 | 399 | 35 | 20 | 89 | 36 |
| Future Volume (vph) | 30 | 524 | 59 | 399 | 35 | 20 | 89 | 36 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 2 | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 23.0 | 23.0 | 23.0 | 23.0 | 31.0 | 31.0 | 31.0 | 31.0 |
| Total Split (s) | 58.0 | 58.0 | 58.0 | 58.0 | 32.0 | 32.0 | 32.0 | 32.0 |
| Total Split (%) | 64.4% | 64.4% | 64.4% | 64.4% | 35.6% | 35.6% | 35.6% | 35.6% |
| 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | | 60.0 | | 60.0 | | 18.0 | | 18.0 |
| Actuated g/C Ratio | | 0.67 | | 0.67 | | 0.20 | | 0.20 |
| v/c Ratio | | 0.30 | | 0.28 | | 0.37 | | 0.64 |
| Control Delay | | 7.3 | | 7.2 | | 18.6 | | 38.4 |
| Queue Delay | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Total Delay | | 7.3 | | 7.2 | | 18.6 | | 38.4 |
| LOS | | A | | A | | B | | D |
| Approach Delay | | 7.3 | | 7.2 | | 18.6 | | 38.4 |
| Approach LOS | | A | | A | | B | | D |

Intersection Summary

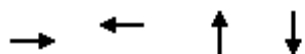
Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 33 (37%), Referenced to phase 2:EBWB, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.64
 Intersection Signal Delay: 12.2
 Intersection Capacity Utilization 64.3%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 8: Archdekin Drive & Vodden Street East



Queues
8: Archdekin Drive & Vodden Street East

<Existing>AM
06-01-2020



| Lane Group | EBT | WBT | NBT | SBT |
|-----------------------------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 625 | 527 | 126 | 185 |
| v/c Ratio | 0.30 | 0.28 | 0.37 | 0.64 |
| Control Delay | 7.3 | 7.2 | 18.6 | 38.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 7.3 | 7.2 | 18.6 | 38.4 |
| Queue Length 50th (m) | 16.2 | 16.7 | 9.4 | 26.3 |
| Queue Length 95th (m) | 21.5 | 31.2 | 22.0 | 42.9 |
| Internal Link Dist (m) | 418.5 | 579.8 | 115.4 | 151.2 |
| Turn Bay Length (m) | | | | |
| Base Capacity (vph) | 2116 | 1880 | 465 | 413 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.30 | 0.28 | 0.27 | 0.45 |
| Intersection Summary | | | | |

HCM Signalized Intersection Capacity Analysis
8: Archdekin Drive & Vodden Street East

<Existing>AM
06-01-2020



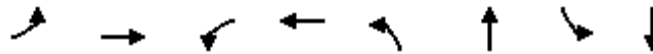
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|------|------|------|-------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | | ↕ | | | ↕ | |
| Traffic Volume (vph) | 30 | 524 | 20 | 59 | 399 | 27 | 35 | 20 | 61 | 89 | 36 | 45 |
| Future Volume (vph) | 30 | 524 | 20 | 59 | 399 | 27 | 35 | 20 | 61 | 89 | 36 | 45 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | |
| Frbp, ped/bikes | | 1.00 | | | 1.00 | | | 0.99 | | | 0.99 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 0.99 | | | 0.99 | |
| Frt | | 0.99 | | | 0.99 | | | 0.93 | | | 0.96 | |
| Flt Protected | | 1.00 | | | 0.99 | | | 0.99 | | | 0.97 | |
| Satd. Flow (prot) | | 3489 | | | 3460 | | | 1681 | | | 1739 | |
| Flt Permitted | | 0.91 | | | 0.81 | | | 0.85 | | | 0.77 | |
| Satd. Flow (perm) | | 3168 | | | 2814 | | | 1458 | | | 1380 | |
| 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) | 33 | 570 | 22 | 64 | 434 | 29 | 38 | 22 | 66 | 97 | 39 | 49 |
| RTOR Reduction (vph) | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 50 | 0 | 0 | 16 | 0 |
| Lane Group Flow (vph) | 0 | 623 | 0 | 0 | 523 | 0 | 0 | 76 | 0 | 0 | 169 | 0 |
| Confl. Peds. (#/hr) | 15 | | 4 | 4 | | 15 | 25 | | 12 | 12 | | 25 |
| Heavy Vehicles (%) | 4% | 3% | 0% | 4% | 3% | 4% | 6% | 5% | 0% | 3% | 3% | 0% |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | |
| Actuated Green, G (s) | | 60.0 | | | 60.0 | | | 18.0 | | | 18.0 | |
| Effective Green, g (s) | | 60.0 | | | 60.0 | | | 18.0 | | | 18.0 | |
| Actuated g/C Ratio | | 0.67 | | | 0.67 | | | 0.20 | | | 0.20 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | | 2112 | | | 1876 | | | 291 | | | 276 | |
| v/s Ratio Prot | | | | | | | | | | | | |
| v/s Ratio Perm | | c0.20 | | | 0.19 | | | 0.05 | | | c0.12 | |
| v/c Ratio | | 0.29 | | | 0.28 | | | 0.26 | | | 0.61 | |
| Uniform Delay, d1 | | 6.2 | | | 6.1 | | | 30.4 | | | 32.8 | |
| Progression Factor | | 1.01 | | | 1.00 | | | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | | 0.3 | | | 0.4 | | | 1.0 | | | 5.7 | |
| Delay (s) | | 6.6 | | | 6.5 | | | 31.4 | | | 38.5 | |
| Level of Service | | A | | | A | | | C | | | D | |
| Approach Delay (s) | | 6.6 | | | 6.5 | | | 31.4 | | | 38.5 | |
| Approach LOS | | A | | | A | | | C | | | D | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 12.7 | | | | HCM 2000 Level of Service | | | B | | |
| HCM 2000 Volume to Capacity ratio | | | 0.37 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | Sum of lost time (s) | | 12.0 | | | |
| Intersection Capacity Utilization | | | 64.3% | | | | ICU Level of Service | | | C | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings

<Existing>AM

9: Laurelcrest Street/Leeward Drive & Vodden Street East

06-01-2020

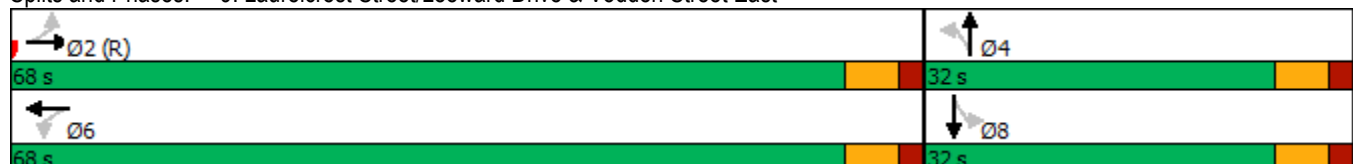


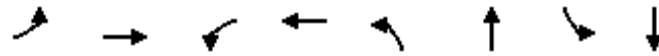
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ |
| Traffic Volume (vph) | 2 | 454 | 294 | 342 | 62 | 2 | 8 | 34 |
| Future Volume (vph) | 2 | 454 | 294 | 342 | 62 | 2 | 8 | 34 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 68.0 | 68.0 | 68.0 | 68.0 | 32.0 | 32.0 | 32.0 | 32.0 |
| Total Split (%) | 68.0% | 68.0% | 68.0% | 68.0% | 32.0% | 32.0% | 32.0% | 32.0% |
| 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? | | | | | | | | |
| Recall Mode | C-Max | C-Max | Max | Max | Max | Max | Max | Max |
| Act Effct Green (s) | 62.0 | 62.0 | 62.0 | 62.0 | 26.0 | 26.0 | 26.0 | 26.0 |
| Actuated g/C Ratio | 0.62 | 0.62 | 0.62 | 0.62 | 0.26 | 0.26 | 0.26 | 0.26 |
| v/c Ratio | 0.00 | 0.38 | 0.86 | 0.18 | 0.20 | 0.17 | 0.03 | 0.09 |
| Control Delay | 7.5 | 6.7 | 41.4 | 8.2 | 31.0 | 8.3 | 28.1 | 24.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 7.5 | 6.7 | 41.4 | 8.2 | 31.0 | 8.3 | 28.1 | 24.8 |
| LOS | A | A | D | A | C | A | C | C |
| Approach Delay | | 6.7 | | 23.2 | | 19.0 | | 25.4 |
| Approach LOS | | A | | C | | B | | C |

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 84 (84%), Referenced to phase 2:EBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 15.1
 Intersection Capacity Utilization 70.6%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 9: Laurelcrest Street/Leeward Drive & Vodden Street East





| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|--------|-------|------|------|------|-------|
| Lane Group Flow (vph) | 2 | 798 | 320 | 390 | 67 | 76 | 9 | 45 |
| v/c Ratio | 0.00 | 0.38 | 0.86 | 0.18 | 0.20 | 0.17 | 0.03 | 0.09 |
| Control Delay | 7.5 | 6.7 | 41.4 | 8.2 | 31.0 | 8.3 | 28.1 | 24.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 7.5 | 6.7 | 41.4 | 8.2 | 31.0 | 8.3 | 28.1 | 24.8 |
| Queue Length 50th (m) | 0.2 | 23.5 | 46.6 | 15.2 | 10.2 | 0.3 | 1.3 | 5.4 |
| Queue Length 95th (m) | 1.0 | 33.9 | #106.2 | 21.6 | 21.3 | 10.9 | 5.2 | 13.9 |
| Internal Link Dist (m) | | 266.2 | | 256.7 | | 92.3 | | 301.6 |
| Turn Bay Length (m) | 36.0 | | 42.5 | | 43.0 | | 22.0 | |
| Base Capacity (vph) | 605 | 2121 | 370 | 2154 | 329 | 443 | 304 | 490 |
| 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 | 0.00 | 0.38 | 0.86 | 0.18 | 0.20 | 0.17 | 0.03 | 0.09 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 9: Laurelcrest Street/Leeward Drive & Vodden Street East

<Existing>AM
 06-01-2020



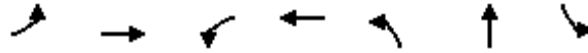
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|-------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↗ | ↗↘ | | ↗ | ↗↘ | | ↗ | ↘ | | ↗ | ↘ | |
| Traffic Volume (vph) | 2 | 454 | 281 | 294 | 342 | 17 | 62 | 2 | 68 | 8 | 34 | 7 |
| Future Volume (vph) | 2 | 454 | 281 | 294 | 342 | 17 | 62 | 2 | 68 | 8 | 34 | 7 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| 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 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | |
| Frt | 1.00 | 0.94 | | 1.00 | 0.99 | | 1.00 | 0.85 | | 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) | 1780 | 3267 | | 1776 | 3469 | | 1655 | 1496 | | 1571 | 1863 | |
| Flt Permitted | 0.52 | 1.00 | | 0.32 | 1.00 | | 0.73 | 1.00 | | 0.71 | 1.00 | |
| Satd. Flow (perm) | 977 | 3267 | | 596 | 3469 | | 1268 | 1496 | | 1170 | 1863 | |
| 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) | 2 | 493 | 305 | 320 | 372 | 18 | 67 | 2 | 74 | 9 | 37 | 8 |
| RTOR Reduction (vph) | 0 | 95 | 0 | 0 | 3 | 0 | 0 | 55 | 0 | 0 | 6 | 0 |
| Lane Group Flow (vph) | 2 | 703 | 0 | 320 | 387 | 0 | 67 | 21 | 0 | 9 | 39 | 0 |
| Confl. Peds. (#/hr) | 2 | | 7 | 7 | | 2 | 6 | | 4 | 4 | | 6 |
| Heavy Vehicles (%) | 0% | 5% | 2% | 0% | 4% | 12% | 7% | 0% | 8% | 13% | 0% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | |
| Actuated Green, G (s) | 62.0 | 62.0 | | 62.0 | 62.0 | | 26.0 | 26.0 | | 26.0 | 26.0 | |
| Effective Green, g (s) | 62.0 | 62.0 | | 62.0 | 62.0 | | 26.0 | 26.0 | | 26.0 | 26.0 | |
| Actuated g/C Ratio | 0.62 | 0.62 | | 0.62 | 0.62 | | 0.26 | 0.26 | | 0.26 | 0.26 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 605 | 2025 | | 369 | 2150 | | 329 | 388 | | 304 | 484 | |
| v/s Ratio Prot | | 0.22 | | | 0.11 | | | 0.01 | | | 0.02 | |
| v/s Ratio Perm | 0.00 | | | c0.54 | | | c0.05 | | | 0.01 | | |
| v/c Ratio | 0.00 | 0.35 | | 0.87 | 0.18 | | 0.20 | 0.05 | | 0.03 | 0.08 | |
| Uniform Delay, d1 | 7.2 | 9.2 | | 15.6 | 8.1 | | 28.9 | 27.8 | | 27.6 | 28.0 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.0 | 0.5 | | 23.0 | 0.2 | | 1.4 | 0.3 | | 0.2 | 0.3 | |
| Delay (s) | 7.2 | 9.7 | | 38.6 | 8.3 | | 30.3 | 28.0 | | 27.8 | 28.3 | |
| Level of Service | A | A | | D | A | | C | C | | C | C | |
| Approach Delay (s) | | 9.7 | | | 22.0 | | | 29.1 | | | 28.2 | |
| Approach LOS | | A | | | C | | | C | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 17.0 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.67 | | |
| Actuated Cycle Length (s) | 100.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 70.6% | ICU Level of Service | C |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

Timings
10: Vodden Street East & Howden Blvd

<Existing>AM
06-01-2020

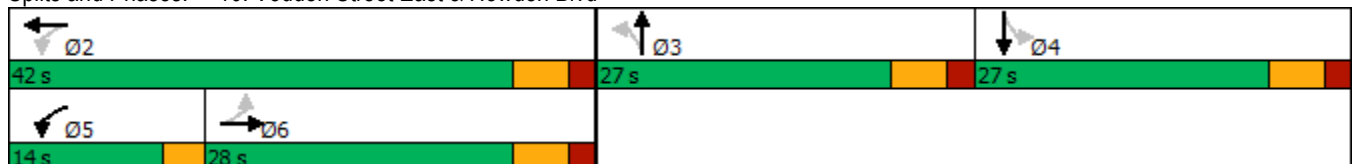


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL |
|----------------------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ |
| Traffic Volume (vph) | 2 | 307 | 188 | 123 | 170 | 5 | 1 |
| Future Volume (vph) | 2 | 307 | 188 | 123 | 170 | 5 | 1 |
| Turn Type | Perm | NA | pm+pt | NA | Perm | NA | Perm |
| Protected Phases | | 6 | 5 | 2 | | 3 | |
| Permitted Phases | 6 | | 2 | | 3 | | 4 |
| Detector Phase | 6 | 6 | 5 | 2 | 3 | 3 | 4 |
| Switch Phase | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 24.0 | 24.0 | 9.0 | 24.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 28.0 | 28.0 | 14.0 | 42.0 | 27.0 | 27.0 | 27.0 |
| Total Split (%) | 29.2% | 29.2% | 14.6% | 43.8% | 28.1% | 28.1% | 28.1% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 0.0 | 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lag | Lag | Lead | | Lead | Lead | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | | Yes | Yes | Yes |
| Recall Mode | Max | Max | None | Max | None | None | None |
| Act Effct Green (s) | 24.6 | 24.6 | 39.2 | 36.2 | 21.1 | 21.1 | 8.1 |
| Actuated g/C Ratio | 0.34 | 0.34 | 0.55 | 0.50 | 0.29 | 0.29 | 0.11 |
| v/c Ratio | 0.00 | 0.52 | 0.48 | 0.07 | 1.67 | 0.45 | 0.00 |
| Control Delay | 19.5 | 12.9 | 13.7 | 10.4 | 360.8 | 5.7 | 31.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 19.5 | 12.9 | 13.7 | 10.4 | 360.8 | 5.7 | 31.0 |
| LOS | B | B | B | B | F | A | C |
| Approach Delay | | 12.9 | | 12.4 | | 130.9 | |
| Approach LOS | | B | | B | | F | |

Intersection Summary

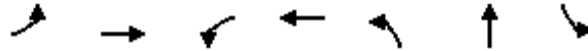
Cycle Length: 96
 Actuated Cycle Length: 71.8
 Natural Cycle: 90
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 1.67
 Intersection Signal Delay: 51.3
 Intersection Capacity Utilization 64.1%
 Analysis Period (min) 15
 Intersection LOS: D
 ICU Level of Service C

Splits and Phases: 10: Vodden Street East & Howden Blvd



Queues
10: Vodden Street East & Howden Blvd

<Existing>AM
06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL |
|------------------------|------|-------|------|-------|-------|-------|------|
| Lane Group Flow (vph) | 2 | 680 | 188 | 123 | 170 | 312 | 1 |
| v/c Ratio | 0.00 | 0.52 | 0.48 | 0.07 | 1.67 | 0.45 | 0.00 |
| Control Delay | 19.5 | 12.9 | 13.7 | 10.4 | 360.8 | 5.7 | 31.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 19.5 | 12.9 | 13.7 | 10.4 | 360.8 | 5.7 | 31.0 |
| Queue Length 50th (m) | 0.2 | 18.6 | 10.7 | 3.8 | ~32.1 | 0.4 | 0.1 |
| Queue Length 95th (m) | 1.8 | 45.0 | 29.6 | 10.6 | #78.9 | 19.1 | 1.6 |
| Internal Link Dist (m) | | 397.6 | | 661.5 | | 256.7 | |
| Turn Bay Length (m) | 6.0 | | 25.5 | | | | |
| Base Capacity (vph) | 430 | 1302 | 437 | 1740 | 102 | 688 | 552 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.00 | 0.52 | 0.43 | 0.07 | 1.67 | 0.45 | 0.00 |

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
10: Vodden Street East & Howden Blvd

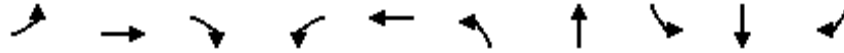
<Existing>AM
06-01-2020

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|--|---|---|--|---|---|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |   | |  |   | |  |  | |  |  | |
| Traffic Volume (vph) | 2 | 307 | 373 | 188 | 123 | 0 | 170 | 5 | 307 | 1 | 0 | 0 |
| Future Volume (vph) | 2 | 307 | 373 | 188 | 123 | 0 | 170 | 5 | 307 | 1 | 0 | 0 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | | |
| Fr _t | 1.00 | 0.92 | | 1.00 | 1.00 | | 1.00 | 0.85 | | 1.00 | | |
| Fl _t Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | | |
| Satd. Flow (prot) | 1775 | 3238 | | 1699 | 3455 | | 1750 | 1606 | | 1785 | | |
| Fl _t Permitted | 0.67 | 1.00 | | 0.25 | 1.00 | | 0.19 | 1.00 | | 1.00 | | |
| Satd. Flow (perm) | 1260 | 3238 | | 450 | 3455 | | 349 | 1606 | | 1879 | | |
| Peak-hour factor, PHF | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 2 | 307 | 373 | 188 | 123 | 0 | 170 | 5 | 307 | 1 | 0 | 0 |
| RTOR Reduction (vph) | 0 | 202 | 0 | 0 | 0 | 0 | 0 | 223 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 2 | 478 | 0 | 188 | 123 | 0 | 170 | 89 | 0 | 1 | 0 | 0 |
| Confl. Peds. (#/hr) | 3 | | 10 | 10 | | 3 | 1 | | | | | 1 |
| Heavy Vehicles (%) | 0% | 2% | 1% | 5% | 5% | 2% | 2% | 0% | 2% | 0% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | | Perm | | |
| Protected Phases | | 6 | | 5 | 2 | | | 3 | | | | 4 |
| Permitted Phases | 6 | | | 2 | | | 3 | | | 4 | | |
| Actuated Green, G (s) | 24.6 | 24.6 | | 36.2 | 36.2 | | 21.1 | 21.1 | | 1.4 | | |
| Effective Green, g (s) | 24.6 | 24.6 | | 36.2 | 36.2 | | 21.1 | 21.1 | | 1.4 | | |
| Actuated g/C Ratio | 0.32 | 0.32 | | 0.47 | 0.47 | | 0.28 | 0.28 | | 0.02 | | |
| Clearance Time (s) | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | | |
| Lane Grp Cap (vph) | 404 | 1038 | | 352 | 1630 | | 96 | 441 | | 34 | | |
| v/s Ratio Prot | | 0.15 | | c0.06 | 0.04 | | | 0.06 | | | | |
| v/s Ratio Perm | 0.00 | | | c0.19 | | | c0.49 | | | c0.00 | | |
| v/c Ratio | 0.00 | 0.46 | | 0.53 | 0.08 | | 1.77 | 0.20 | | 0.03 | | |
| Uniform Delay, d1 | 17.7 | 20.8 | | 12.9 | 11.1 | | 27.8 | 21.3 | | 37.0 | | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | | |
| Incremental Delay, d2 | 0.0 | 1.5 | | 1.6 | 0.1 | | 385.6 | 0.5 | | 0.7 | | |
| Delay (s) | 17.7 | 22.2 | | 14.5 | 11.2 | | 413.4 | 21.8 | | 37.7 | | |
| Level of Service | B | C | | B | B | | F | C | | D | | |
| Approach Delay (s) | | 22.2 | | | 13.2 | | | 159.9 | | | | 37.7 |
| Approach LOS | | C | | | B | | | F | | | | D |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 65.3 | | | | HCM 2000 Level of Service | | | E | | |
| HCM 2000 Volume to Capacity ratio | | | 1.01 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 76.7 | | | | Sum of lost time (s) | | | 21.0 | | |
| Intersection Capacity Utilization | | | 64.1% | | | | ICU Level of Service | | | C | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
11: Howden Blvd/N Park Drive & Willams Parkway

<Existing>AM
06-01-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↗ | ↗↗ | ↗ | ↗ | ↗↗ | ↗ | ↗↗ | ↗ | ↗↗ | ↗ |
| Traffic Volume (vph) | 205 | 842 | 198 | 70 | 667 | 152 | 290 | 107 | 519 | 452 |
| Future Volume (vph) | 205 | 842 | 198 | 70 | 667 | 152 | 290 | 107 | 519 | 452 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | pm+pt | NA | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | 7 | 4 | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 4 | | 8 | | 8 |
| Detector Phase | 5 | 2 | 2 | 6 | 6 | 7 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 9.0 | 43.0 | 43.0 | 43.0 | 43.0 | 9.0 | 48.0 | 48.0 | 48.0 | 48.0 |
| Total Split (s) | 18.0 | 90.0 | 90.0 | 72.0 | 72.0 | 10.0 | 70.0 | 60.0 | 60.0 | 60.0 |
| Total Split (%) | 11.3% | 56.3% | 56.3% | 45.0% | 45.0% | 6.3% | 43.8% | 37.5% | 37.5% | 37.5% |
| Yellow Time (s) | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 0.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 0.0 | 0.0 |
| Total Lost Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lead | | | Lag | Lag | Lead | | Lag | Lag | Lag |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | Yes | | Yes | Yes | Yes |
| Recall Mode | None | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 92.8 | 89.8 | 89.8 | 73.7 | 73.7 | 61.2 | 58.2 | 48.2 | 48.2 | 48.2 |
| Actuated g/C Ratio | 0.58 | 0.56 | 0.56 | 0.46 | 0.46 | 0.38 | 0.36 | 0.30 | 0.30 | 0.30 |
| v/c Ratio | 0.61 | 0.46 | 0.25 | 0.32 | 0.50 | 0.69 | 0.34 | 0.43 | 0.52 | 0.91 |
| Control Delay | 25.0 | 22.8 | 13.0 | 35.3 | 32.9 | 50.6 | 33.5 | 48.5 | 47.4 | 50.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 25.0 | 22.8 | 13.0 | 35.3 | 32.9 | 50.6 | 33.5 | 48.5 | 47.4 | 50.9 |
| LOS | C | C | B | D | C | D | C | D | D | D |
| Approach Delay | | 21.6 | | | 33.1 | | 38.3 | | 49.0 | |
| Approach LOS | | C | | | C | | D | | D | |

Intersection Summary

Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 75 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 34.6
 Intersection Capacity Utilization 102.1%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service G

Splits and Phases: 11: Howden Blvd/N Park Drive & Willams Parkway

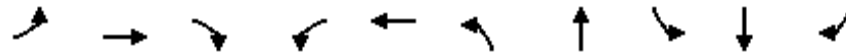


Queues

<Existing>AM

11: Howden Blvd/N Park Drive & Willams Parkway

06-01-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|------------------------|-------|-------|------|------|-------|------|-------|------|-------|--------|
| Lane Group Flow (vph) | 223 | 915 | 215 | 76 | 798 | 165 | 423 | 116 | 564 | 491 |
| v/c Ratio | 0.61 | 0.46 | 0.25 | 0.32 | 0.50 | 0.69 | 0.34 | 0.43 | 0.52 | 0.91 |
| Control Delay | 25.0 | 22.8 | 13.0 | 35.3 | 32.9 | 50.6 | 33.5 | 48.5 | 47.4 | 50.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 25.0 | 22.8 | 13.0 | 35.3 | 32.9 | 50.6 | 33.5 | 48.5 | 47.4 | 50.9 |
| Queue Length 50th (m) | 36.1 | 96.2 | 22.7 | 16.5 | 100.2 | 33.5 | 44.0 | 28.1 | 74.3 | 89.6 |
| Queue Length 95th (m) | 52.4 | 114.2 | 39.1 | 32.1 | 120.7 | 50.9 | 57.6 | 47.4 | 92.1 | #155.3 |
| Internal Link Dist (m) | | 268.4 | | | 661.6 | | 117.9 | | 218.4 | |
| Turn Bay Length (m) | 162.0 | | 20.0 | 44.0 | | 52.5 | | 44.0 | | 21.5 |
| Base Capacity (vph) | 382 | 1973 | 877 | 241 | 1599 | 239 | 1382 | 305 | 1219 | 579 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.58 | 0.46 | 0.25 | 0.32 | 0.50 | 0.69 | 0.31 | 0.38 | 0.46 | 0.85 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 11: Howden Blvd/N Park Drive & Willams Parkway

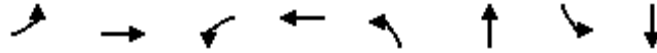
<Existing>AM
 06-01-2020

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|-------|------|--------|------|------|------|---------------------------|------|------|------|------|-------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 205 | 842 | 198 | 70 | 667 | 67 | 152 | 290 | 99 | 107 | 519 | 452 |
| Future Volume (vph) | 205 | 842 | 198 | 70 | 667 | 67 | 152 | 290 | 99 | 107 | 519 | 452 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Lane Util. Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.94 | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 1.00 | 0.83 |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 0.99 | 1.00 | | 0.99 | 1.00 | | 0.98 | 1.00 | 1.00 |
| FrT | 1.00 | 1.00 | 0.85 | 1.00 | 0.99 | | 1.00 | 0.96 | | 1.00 | 1.00 | 0.85 |
| FlT Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1761 | 3515 | 1503 | 1678 | 3462 | | 1727 | 3402 | | 1701 | 3614 | 1294 |
| FlT Permitted | 0.24 | 1.00 | 1.00 | 0.30 | 1.00 | | 0.28 | 1.00 | | 0.51 | 1.00 | 1.00 |
| Satd. Flow (perm) | 452 | 3515 | 1503 | 524 | 3462 | | 502 | 3402 | | 904 | 3614 | 1294 |
| 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) | 223 | 915 | 215 | 76 | 725 | 73 | 165 | 315 | 108 | 116 | 564 | 491 |
| RTOR Reduction (vph) | 0 | 0 | 34 | 0 | 4 | 0 | 0 | 22 | 0 | 0 | 0 | 150 |
| Lane Group Flow (vph) | 223 | 915 | 181 | 76 | 794 | 0 | 165 | 401 | 0 | 116 | 564 | 341 |
| Confl. Peds. (#/hr) | 63 | | 37 | 37 | | 63 | 137 | | 29 | 29 | | 137 |
| Heavy Vehicles (%) | 1% | 3% | 0% | 5% | 2% | 14% | 2% | 2% | 2% | 3% | 1% | 3% |
| Bus Blockages (#/hr) | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | | pm+pt | NA | | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | | 7 | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 89.8 | 89.8 | 89.8 | 73.7 | 73.7 | | 58.2 | 58.2 | | 48.2 | 48.2 | 48.2 |
| Effective Green, g (s) | 89.8 | 89.8 | 89.8 | 73.7 | 73.7 | | 58.2 | 58.2 | | 48.2 | 48.2 | 48.2 |
| Actuated g/C Ratio | 0.56 | 0.56 | 0.56 | 0.46 | 0.46 | | 0.36 | 0.36 | | 0.30 | 0.30 | 0.30 |
| Clearance Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 360 | 1972 | 843 | 241 | 1594 | | 236 | 1237 | | 272 | 1088 | 389 |
| v/s Ratio Prot | c0.05 | 0.26 | | | 0.23 | | c0.03 | 0.12 | | | 0.16 | |
| v/s Ratio Perm | c0.30 | | 0.12 | 0.14 | | | 0.22 | | | 0.13 | | c0.26 |
| v/c Ratio | 0.62 | 0.46 | 0.21 | 0.32 | 0.50 | | 0.70 | 0.32 | | 0.43 | 0.52 | 0.88 |
| Uniform Delay, d1 | 20.2 | 20.8 | 17.5 | 27.2 | 30.2 | | 43.2 | 36.7 | | 44.8 | 46.3 | 53.1 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 3.2 | 0.8 | 0.6 | 3.4 | 1.1 | | 8.7 | 0.3 | | 2.2 | 0.8 | 20.6 |
| Delay (s) | 23.4 | 21.6 | 18.1 | 30.6 | 31.3 | | 51.9 | 37.0 | | 47.1 | 47.1 | 73.7 |
| Level of Service | C | C | B | C | C | | D | D | | D | D | E |
| Approach Delay (s) | | 21.3 | | | 31.3 | | | 41.2 | | | 58.3 | |
| Approach LOS | | C | | | C | | | D | | | E | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 37.3 | | | | HCM 2000 Level of Service | | | | D | |
| HCM 2000 Volume to Capacity ratio | | | 0.72 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 160.0 | | | | Sum of lost time (s) | | | 18.0 | | |
| Intersection Capacity Utilization | | | 102.1% | | | | ICU Level of Service | | | G | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
12: Dixie Road & Howden Blvd

<Existing>AM
06-01-2020

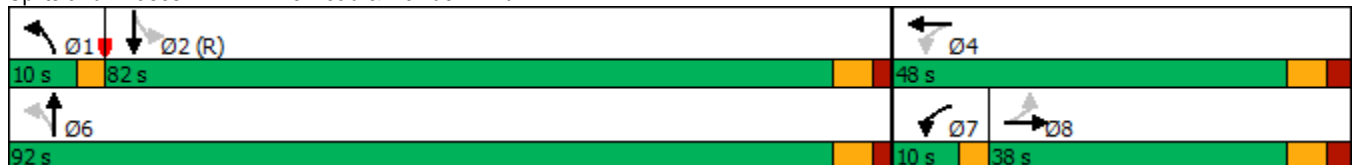


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ |
| Traffic Volume (vph) | 29 | 463 | 100 | 239 | 52 | 413 | 157 | 1701 |
| Future Volume (vph) | 29 | 463 | 100 | 239 | 52 | 413 | 157 | 1701 |
| Turn Type | Perm | NA | pm+pt | NA | pm+pt | NA | Perm | NA |
| Protected Phases | | 8 | 7 | 4 | 1 | 6 | | 2 |
| Permitted Phases | 8 | | 4 | | 6 | | 2 | |
| Detector Phase | 8 | 8 | 7 | 4 | 1 | 6 | 2 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.8 | 36.8 | 8.0 | 36.8 | 8.0 | 40.1 | 40.1 | 40.1 |
| Total Split (s) | 38.0 | 38.0 | 10.0 | 48.0 | 10.0 | 92.0 | 82.0 | 82.0 |
| Total Split (%) | 27.1% | 27.1% | 7.1% | 34.3% | 7.1% | 65.7% | 58.6% | 58.6% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 0.0 | 2.8 | 0.0 | 2.1 | 2.1 | 2.1 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 3.0 | 6.8 | 3.0 | 6.1 | 6.1 | 6.1 |
| Lead/Lag | Lag | Lag | Lead | | Lead | | Lag | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | | Yes | | Yes | Yes |
| Recall Mode | None | None | None | None | None | Max | C-Max | C-Max |
| Act Effct Green (s) | 31.2 | 31.2 | 45.0 | 41.2 | 89.0 | 85.9 | 78.0 | 78.0 |
| Actuated g/C Ratio | 0.22 | 0.22 | 0.32 | 0.29 | 0.64 | 0.61 | 0.56 | 0.56 |
| v/c Ratio | 0.14 | 0.94 | 0.74 | 0.36 | 0.40 | 0.26 | 0.37 | 0.94 |
| Control Delay | 45.7 | 71.0 | 64.9 | 35.5 | 20.3 | 12.1 | 20.9 | 40.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 45.7 | 71.0 | 64.9 | 35.5 | 20.3 | 12.1 | 20.9 | 40.6 |
| LOS | D | E | E | D | C | B | C | D |
| Approach Delay | | 70.0 | | 42.3 | | 12.9 | | 39.0 |
| Approach LOS | | E | | D | | B | | D |

Intersection Summary

Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 107 (76%), Referenced to phase 2:SBTL, Start of Green
 Natural Cycle: 125
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.94
 Intersection Signal Delay: 41.6
 Intersection Capacity Utilization 97.4%
 Analysis Period (min) 15
 Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 12: Dixie Road & Howden Blvd

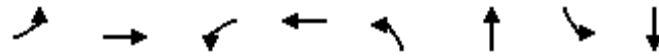


Queues

12: Dixie Road & Howden Blvd

<Existing>AM

06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|--------|-------|-------|------|-------|------|--------|
| Lane Group Flow (vph) | 31 | 733 | 108 | 356 | 56 | 526 | 169 | 1849 |
| v/c Ratio | 0.14 | 0.94 | 0.74 | 0.36 | 0.40 | 0.26 | 0.37 | 0.94 |
| Control Delay | 45.7 | 71.0 | 64.9 | 35.5 | 20.3 | 12.1 | 20.9 | 40.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 45.7 | 71.0 | 64.9 | 35.5 | 20.3 | 12.1 | 20.9 | 40.6 |
| Queue Length 50th (m) | 6.9 | 99.6 | 21.6 | 36.1 | 5.5 | 31.5 | 26.1 | 251.8 |
| Queue Length 95th (m) | 16.1 | #137.6 | #41.6 | 50.2 | 12.9 | 41.0 | 43.8 | #313.0 |
| Internal Link Dist (m) | | 661.5 | | 187.9 | | 169.3 | | 320.7 |
| Turn Bay Length (m) | 53.0 | | 66.0 | | 71.5 | | 40.0 | |
| Base Capacity (vph) | 225 | 776 | 146 | 990 | 144 | 1986 | 459 | 1958 |
| 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 | 0.14 | 0.94 | 0.74 | 0.36 | 0.39 | 0.26 | 0.37 | 0.94 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
12: Dixie Road & Howden Blvd

<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|-------|------|------|-------|------|------|------|---------------------------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 29 | 463 | 219 | 100 | 239 | 92 | 52 | 413 | 76 | 157 | 1701 | 19 |
| Future Volume (vph) | 29 | 463 | 219 | 100 | 239 | 92 | 52 | 413 | 76 | 157 | 1701 | 19 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.1 | | 6.1 | 6.1 | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.95 | | 1.00 | 0.96 | | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1785 | 3308 | | 1767 | 3270 | | 1785 | 3219 | | 1715 | 3515 | |
| Flt Permitted | 0.54 | 1.00 | | 0.12 | 1.00 | | 0.05 | 1.00 | | 0.46 | 1.00 | |
| Satd. Flow (perm) | 1012 | 3308 | | 217 | 3270 | | 93 | 3219 | | 825 | 3515 | |
| Peak-hour factor, PHF | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Adj. Flow (vph) | 31 | 498 | 235 | 108 | 257 | 99 | 56 | 444 | 82 | 169 | 1829 | 20 |
| RTOR Reduction (vph) | 0 | 40 | 0 | 0 | 29 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 31 | 693 | 0 | 108 | 327 | 0 | 56 | 515 | 0 | 169 | 1849 | 0 |
| Confl. Peds. (#/hr) | | | 20 | 20 | | | 14 | | 1 | 1 | | 14 |
| Confl. Bikes (#/hr) | | | | | | | | | 1 | | | |
| Heavy Vehicles (%) | 0% | 3% | 2% | 1% | 7% | 3% | 0% | 9% | 6% | 4% | 2% | 0% |
| Bus Blockages (#/hr) | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 9 | 0 | 0 | 8 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | pm+pt | NA | | Perm | NA | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | | 2 | |
| Permitted Phases | 8 | | | 4 | | | 6 | | | 2 | | |
| Actuated Green, G (s) | 31.2 | 31.2 | | 41.2 | 41.2 | | 85.9 | 85.9 | | 77.4 | 77.4 | |
| Effective Green, g (s) | 31.2 | 31.2 | | 41.2 | 41.2 | | 85.9 | 85.9 | | 77.4 | 77.4 | |
| Actuated g/C Ratio | 0.22 | 0.22 | | 0.29 | 0.29 | | 0.61 | 0.61 | | 0.55 | 0.55 | |
| Clearance Time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.1 | | 6.1 | 6.1 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 225 | 737 | | 141 | 962 | | 123 | 1975 | | 456 | 1943 | |
| v/s Ratio Prot | | c0.21 | | c0.04 | 0.10 | | c0.02 | 0.16 | | | c0.53 | |
| v/s Ratio Perm | 0.03 | | | 0.19 | | | 0.26 | | | 0.20 | | |
| v/c Ratio | 0.14 | 0.94 | | 0.77 | 0.34 | | 0.46 | 0.26 | | 0.37 | 0.95 | |
| Uniform Delay, d1 | 43.6 | 53.5 | | 39.9 | 38.7 | | 30.0 | 12.4 | | 17.6 | 29.5 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.6 | 20.6 | | 21.6 | 0.4 | | 2.7 | 0.3 | | 2.3 | 11.8 | |
| Delay (s) | 44.2 | 74.1 | | 61.5 | 39.2 | | 32.6 | 12.8 | | 19.9 | 41.3 | |
| Level of Service | D | E | | E | D | | C | B | | B | D | |
| Approach Delay (s) | | 72.9 | | | 44.4 | | | 14.7 | | | 39.5 | |
| Approach LOS | | E | | | D | | | B | | | D | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 43.0 | | | | | | | | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | | | 0.92 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 140.0 | | | | | | | | Sum of lost time (s) | 18.9 |
| Intersection Capacity Utilization | | | 97.4% | | | | | | | | ICU Level of Service | F |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings
13: Hanover Road/Highview Trail & Howden Blvd

<Existing>AM
06-01-2020



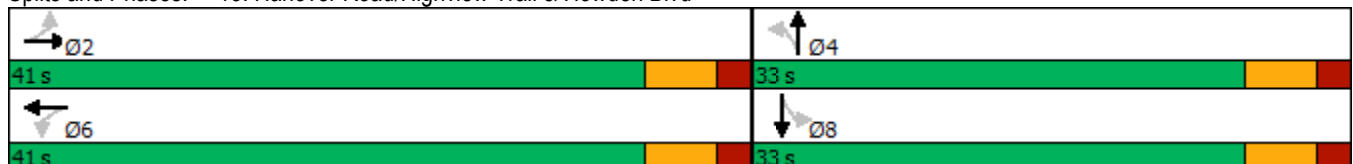
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↔↔ | | ↔↔ | | ↔↔ | | ↔↔ |
| Traffic Volume (vph) | 11 | 631 | 22 | 252 | 154 | 6 | 11 | 14 |
| Future Volume (vph) | 11 | 631 | 22 | 252 | 154 | 6 | 11 | 14 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (s) | 41.0 | 41.0 | 41.0 | 41.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (%) | 55.4% | 55.4% | 55.4% | 55.4% | 44.6% | 44.6% | 44.6% | 44.6% |
| 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | Max | Max | Max | Max | None | None | None | None |
| Act Effect Green (s) | | 37.9 | | 37.9 | | 11.5 | | 11.5 |
| Actuated g/C Ratio | | 0.62 | | 0.62 | | 0.19 | | 0.19 |
| v/c Ratio | | 0.47 | | 0.16 | | 0.40 | | 0.14 |
| Control Delay | | 6.9 | | 5.6 | | 20.5 | | 14.9 |
| Queue Delay | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Total Delay | | 6.9 | | 5.6 | | 20.5 | | 14.9 |
| LOS | | A | | A | | C | | B |
| Approach Delay | | 6.9 | | 5.6 | | 20.5 | | 15.0 |
| Approach LOS | | A | | A | | C | | B |

Intersection Summary

Cycle Length: 74
 Actuated Cycle Length: 61.4
 Natural Cycle: 70
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.47
 Intersection Signal Delay: 8.7
 Intersection Capacity Utilization 60.9%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service B

Splits and Phases: 13: Hanover Road/Highview Trail & Howden Blvd

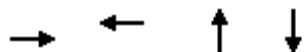


Queues

<Existing>AM

13: Hanover Road/Highview Trail & Howden Blvd

06-01-2020



| Lane Group | EBT | WBT | NBT | SBT |
|-----------------------------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 944 | 306 | 200 | 43 |
| v/c Ratio | 0.47 | 0.16 | 0.40 | 0.14 |
| Control Delay | 6.9 | 5.6 | 20.5 | 14.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 6.9 | 5.6 | 20.5 | 14.9 |
| Queue Length 50th (m) | 22.2 | 6.4 | 8.5 | 2.4 |
| Queue Length 95th (m) | 38.8 | 12.5 | 16.3 | 9.0 |
| Internal Link Dist (m) | 187.9 | 607.3 | 181.5 | 108.7 |
| Turn Bay Length (m) | | | | |
| Base Capacity (vph) | 2029 | 1860 | 1162 | 704 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.47 | 0.16 | 0.17 | 0.06 |
| Intersection Summary | | | | |

HCM Signalized Intersection Capacity Analysis
13: Hanover Road/Highview Trail & Howden Blvd

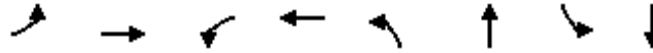
<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|-------|------|------|------|------|
| Lane Configurations | | ↔↔ | | | ↔↔ | | | ↔↔ | | | ↔ | |
| Traffic Volume (vph) | 11 | 631 | 226 | 22 | 252 | 7 | 154 | 6 | 24 | 11 | 14 | 15 |
| Future Volume (vph) | 11 | 631 | 226 | 22 | 252 | 7 | 154 | 6 | 24 | 11 | 14 | 15 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 0.95 | | | 1.00 | |
| Frbp, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 1.00 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 1.00 | |
| Frt | | 0.96 | | | 1.00 | | | 0.98 | | | 0.95 | |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.96 | | | 0.99 | |
| Satd. Flow (prot) | | 3404 | | | 3467 | | | 3340 | | | 1787 | |
| Flt Permitted | | 0.95 | | | 0.87 | | | 0.75 | | | 0.87 | |
| Satd. Flow (perm) | | 3236 | | | 3014 | | | 2599 | | | 1573 | |
| 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) | 12 | 686 | 246 | 24 | 274 | 8 | 167 | 7 | 26 | 12 | 15 | 16 |
| RTOR Reduction (vph) | 0 | 34 | 0 | 0 | 2 | 0 | 0 | 20 | 0 | 0 | 13 | 0 |
| Lane Group Flow (vph) | 0 | 910 | 0 | 0 | 304 | 0 | 0 | 180 | 0 | 0 | 30 | 0 |
| Confl. Peds. (#/hr) | 7 | | 9 | 9 | | 7 | 1 | | 14 | 14 | | 1 |
| Heavy Vehicles (%) | 0% | 2% | 4% | 10% | 4% | 0% | 3% | 0% | 0% | 0% | 0% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | |
| Actuated Green, G (s) | | 37.9 | | | 37.9 | | | 11.5 | | | 11.5 | |
| Effective Green, g (s) | | 37.9 | | | 37.9 | | | 11.5 | | | 11.5 | |
| Actuated g/C Ratio | | 0.62 | | | 0.62 | | | 0.19 | | | 0.19 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | | 1997 | | | 1860 | | | 486 | | | 294 | |
| v/s Ratio Prot | | | | | | | | | | | | |
| v/s Ratio Perm | | c0.28 | | | 0.10 | | | c0.07 | | | 0.02 | |
| v/c Ratio | | 0.46 | | | 0.16 | | | 0.37 | | | 0.10 | |
| Uniform Delay, d1 | | 6.3 | | | 5.0 | | | 21.8 | | | 20.7 | |
| Progression Factor | | 1.00 | | | 1.00 | | | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | | 0.8 | | | 0.2 | | | 1.0 | | | 0.3 | |
| Delay (s) | | 7.0 | | | 5.2 | | | 22.8 | | | 21.0 | |
| Level of Service | | A | | | A | | | C | | | C | |
| Approach Delay (s) | | 7.0 | | | 5.2 | | | 22.8 | | | 21.0 | |
| Approach LOS | | A | | | A | | | C | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 9.2 | | | | HCM 2000 Level of Service | | | A | | |
| HCM 2000 Volume to Capacity ratio | | | 0.44 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 61.4 | | | | Sum of lost time (s) | | 12.0 | | | |
| Intersection Capacity Utilization | | | 60.9% | | | | ICU Level of Service | | | B | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings
14: Central Park Drive & Hanover Road

<Existing>AM
06-01-2020

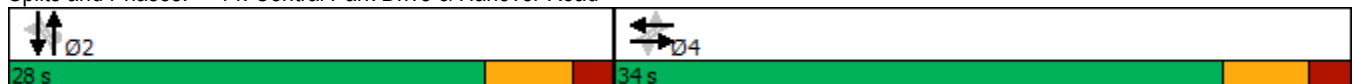


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↕↕ | | ↕↕ | ↕ | ↕↕ | | ↕↕ |
| Traffic Volume (vph) | 71 | 6 | 5 | 2 | 129 | 207 | 7 | 780 |
| Future Volume (vph) | 71 | 6 | 5 | 2 | 129 | 207 | 7 | 780 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 4 | | 4 | | 2 | | 2 |
| Permitted Phases | 4 | | 4 | | 2 | | 2 | |
| Detector Phase | 4 | 4 | 4 | 4 | 2 | 2 | 2 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (%) | 54.8% | 54.8% | 54.8% | 54.8% | 45.2% | 45.2% | 45.2% | 45.2% |
| 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | Max | Max | Max | Max |
| Act Effct Green (s) | | 15.0 | | 15.0 | 22.1 | 22.1 | | 22.1 |
| Actuated g/C Ratio | | 0.30 | | 0.30 | 0.45 | 0.45 | | 0.45 |
| v/c Ratio | | 0.52 | | 0.02 | 0.67 | 0.16 | | 0.58 |
| Control Delay | | 15.0 | | 8.3 | 34.4 | 8.9 | | 12.8 |
| Queue Delay | | 0.0 | | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | | 15.0 | | 8.3 | 34.4 | 8.9 | | 12.8 |
| LOS | | B | | A | C | A | | B |
| Approach Delay | | 15.0 | | 8.3 | | 18.3 | | 12.8 |
| Approach LOS | | B | | A | | B | | B |

Intersection Summary

| | |
|---|------------------------|
| Cycle Length: 62 | |
| Actuated Cycle Length: 49.2 | |
| Natural Cycle: 70 | |
| Control Type: Semi Act-Uncoord | |
| Maximum v/c Ratio: 0.67 | |
| Intersection Signal Delay: 14.5 | Intersection LOS: B |
| Intersection Capacity Utilization 75.4% | ICU Level of Service D |
| Analysis Period (min) 15 | |

Splits and Phases: 14: Central Park Drive & Hanover Road



Queues
14: Central Park Drive & Hanover Road

<Existing>AM
06-01-2020



| Lane Group | EBT | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 443 | 16 | 140 | 239 | 882 |
| v/c Ratio | 0.52 | 0.02 | 0.67 | 0.16 | 0.58 |
| Control Delay | 15.0 | 8.3 | 34.4 | 8.9 | 12.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 15.0 | 8.3 | 34.4 | 8.9 | 12.8 |
| Queue Length 50th (m) | 14.9 | 0.2 | 8.9 | 5.7 | 27.7 |
| Queue Length 95th (m) | 24.8 | 1.6 | #37.9 | 13.3 | 52.6 |
| Internal Link Dist (m) | 532.7 | 113.0 | | 177.3 | 377.5 |
| Turn Bay Length (m) | | | 44.5 | | |
| Base Capacity (vph) | 1573 | 1592 | 208 | 1514 | 1509 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.28 | 0.01 | 0.67 | 0.16 | 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
14: Central Park Drive & Hanover Road

<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|-------|------|------|------|------|-------|------|------|------|------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | ↕ | ↕↕ | | | ↕↕ | |
| Traffic Volume (vph) | 71 | 6 | 330 | 5 | 2 | 8 | 129 | 207 | 13 | 7 | 780 | 24 |
| Future Volume (vph) | 71 | 6 | 330 | 5 | 2 | 8 | 129 | 207 | 13 | 7 | 780 | 24 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | 1.00 | 0.95 | | | 0.95 | |
| Frbp, ped/bikes | | 0.98 | | | 0.99 | | 1.00 | 1.00 | | | 1.00 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Frt | | 0.88 | | | 0.92 | | 1.00 | 0.99 | | | 1.00 | |
| Flt Protected | | 0.99 | | | 0.98 | | 0.95 | 1.00 | | | 1.00 | |
| Satd. Flow (prot) | | 3027 | | | 3250 | | 1615 | 3358 | | | 3518 | |
| Flt Permitted | | 0.89 | | | 0.84 | | 0.27 | 1.00 | | | 0.95 | |
| Satd. Flow (perm) | | 2729 | | | 2780 | | 464 | 3358 | | | 3350 | |
| 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 | 7 | 359 | 5 | 2 | 9 | 140 | 225 | 14 | 8 | 848 | 26 |
| RTOR Reduction (vph) | 0 | 24 | 0 | 0 | 6 | 0 | 0 | 6 | 0 | 0 | 3 | 0 |
| Lane Group Flow (vph) | 0 | 419 | 0 | 0 | 10 | 0 | 140 | 233 | 0 | 0 | 879 | 0 |
| Confl. Peds. (#/hr) | 15 | | 13 | 13 | | | 15 | 27 | | 13 | 13 | 27 |
| Heavy Vehicles (%) | 5% | 0% | 3% | 0% | 0% | 0% | 10% | 8% | 0% | 0% | 3% | 9% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 4 | | | 2 | | | 2 | |
| Permitted Phases | 4 | | | 4 | | | 2 | | | 2 | | |
| Actuated Green, G (s) | | 15.0 | | | 15.0 | | 22.1 | 22.1 | | | 22.1 | |
| Effective Green, g (s) | | 15.0 | | | 15.0 | | 22.1 | 22.1 | | | 22.1 | |
| Actuated g/C Ratio | | 0.31 | | | 0.31 | | 0.45 | 0.45 | | | 0.45 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | | 833 | | | 849 | | 208 | 1511 | | | 1507 | |
| v/s Ratio Prot | | | | | | | | 0.07 | | | | |
| v/s Ratio Perm | | c0.15 | | | 0.00 | | c0.30 | | | | 0.26 | |
| v/c Ratio | | 0.50 | | | 0.01 | | 0.67 | 0.15 | | | 0.58 | |
| Uniform Delay, d1 | | 14.0 | | | 11.9 | | 10.7 | 8.0 | | | 10.1 | |
| Progression Factor | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | | 1.0 | | | 0.0 | | 16.1 | 0.2 | | | 1.7 | |
| Delay (s) | | 15.0 | | | 11.9 | | 26.7 | 8.2 | | | 11.7 | |
| Level of Service | | B | | | B | | C | A | | | B | |
| Approach Delay (s) | | 15.0 | | | 11.9 | | | 15.0 | | | 11.7 | |
| Approach LOS | | B | | | B | | | B | | | B | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 13.3 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.60 | | |
| Actuated Cycle Length (s) | 49.1 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 75.4% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

Timings
15: Central Park Drive & Howden Blvd

<Existing>AM
06-01-2020

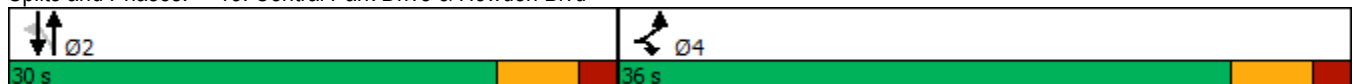


| Lane Group | EBL | EBR | NBL | NBT | SBT |
|----------------------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | |
| Traffic Volume (vph) | 228 | 282 | 62 | 178 | 464 |
| Future Volume (vph) | 228 | 282 | 62 | 178 | 464 |
| Turn Type | Prot | Prot | Perm | NA | NA |
| Protected Phases | 4 | 4 | | 2 | 2 |
| Permitted Phases | | | 2 | | |
| Detector Phase | 4 | 4 | 2 | 2 | 2 |
| Switch Phase | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 54.5% | 54.5% | 45.5% | 45.5% | 45.5% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | |
| Lead-Lag Optimize? | | | | | |
| Recall Mode | None | None | Max | Max | Max |
| Act Effct Green (s) | 15.1 | 15.1 | 24.2 | 24.2 | 24.2 |
| Actuated g/C Ratio | 0.29 | 0.29 | 0.47 | 0.47 | 0.47 |
| v/c Ratio | 0.48 | 0.53 | 0.22 | 0.12 | 0.42 |
| Control Delay | 17.7 | 11.2 | 12.2 | 9.1 | 9.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.7 | 11.2 | 12.2 | 9.1 | 9.5 |
| LOS | B | B | B | A | A |
| Approach Delay | 14.1 | | | 9.9 | 9.5 |
| Approach LOS | B | | | A | A |

Intersection Summary

Cycle Length: 66
 Actuated Cycle Length: 51.4
 Natural Cycle: 70
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.53
 Intersection Signal Delay: 11.3
 Intersection Capacity Utilization 54.7%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 15: Central Park Drive & Howden Blvd



Queues

<Existing>AM

15: Central Park Drive & Howden Blvd

06-01-2020



| Lane Group | EBL | EBR | NBL | NBT | SBT |
|------------------------|-------|------|------|-------|-------|
| Lane Group Flow (vph) | 248 | 307 | 67 | 193 | 693 |
| v/c Ratio | 0.48 | 0.53 | 0.22 | 0.12 | 0.42 |
| Control Delay | 17.7 | 11.2 | 12.2 | 9.1 | 9.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.7 | 11.2 | 12.2 | 9.1 | 9.5 |
| Queue Length 50th (m) | 18.3 | 11.2 | 3.3 | 4.7 | 16.9 |
| Queue Length 95th (m) | 33.4 | 27.3 | 12.3 | 11.8 | 36.0 |
| Internal Link Dist (m) | 607.3 | | | 377.5 | 147.1 |
| Turn Bay Length (m) | | | 65.0 | | |
| Base Capacity (vph) | 1041 | 1002 | 306 | 1619 | 1631 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.24 | 0.31 | 0.22 | 0.12 | 0.42 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis

15: Central Park Drive & Howden Blvd

<Existing>AM
06-01-2020



















| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|------------------------|-------|------|------|------|-------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 228 | 282 | 62 | 178 | 464 | 174 |
| Future Volume (vph) | 228 | 282 | 62 | 178 | 464 | 174 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 0.95 | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | 0.99 | 1.00 | 1.00 | |
| Frt | 1.00 | 0.85 | 1.00 | 1.00 | 0.96 | |
| Flt Protected | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 | |
| Satd. Flow (prot) | 1772 | 1601 | 1659 | 3444 | 3371 | |
| Flt Permitted | 0.95 | 1.00 | 0.37 | 1.00 | 1.00 | |
| Satd. Flow (perm) | 1772 | 1601 | 652 | 3444 | 3371 | |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj. Flow (vph) | 248 | 307 | 67 | 193 | 504 | 189 |
| RTOR Reduction (vph) | 0 | 104 | 0 | 0 | 49 | 0 |
| Lane Group Flow (vph) | 248 | 203 | 67 | 193 | 644 | 0 |
| Confl. Peds. (#/hr) | 3 | 1 | 24 | | | 24 |
| Heavy Vehicles (%) | 3% | 2% | 7% | 6% | 2% | 6% |
| Turn Type | Prot | Prot | Perm | NA | NA | |
| Protected Phases | 4 | 4 | | 2 | 2 | |
| Permitted Phases | | | 2 | | | |
| Actuated Green, G (s) | 15.2 | 15.2 | 24.2 | 24.2 | 24.2 | |
| Effective Green, g (s) | 15.2 | 15.2 | 24.2 | 24.2 | 24.2 | |
| Actuated g/C Ratio | 0.30 | 0.30 | 0.47 | 0.47 | 0.47 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 524 | 473 | 306 | 1621 | 1587 | |
| v/s Ratio Prot | c0.14 | 0.13 | | 0.06 | c0.19 | |
| v/s Ratio Perm | | | 0.10 | | | |
| v/c Ratio | 0.47 | 0.43 | 0.22 | 0.12 | 0.41 | |
| Uniform Delay, d1 | 14.8 | 14.6 | 8.0 | 7.6 | 8.9 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | 1.4 | 1.3 | 1.6 | 0.2 | 0.8 | |
| Delay (s) | 16.2 | 15.9 | 9.7 | 7.8 | 9.7 | |
| Level of Service | B | B | A | A | A | |
| Approach Delay (s) | 16.1 | | | 8.3 | 9.7 | |
| Approach LOS | B | | | A | A | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 11.8 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.43 | | |
| Actuated Cycle Length (s) | 51.4 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 54.7% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

HCM Unsignalized Intersection Capacity Analysis
 16: Isabella Street & Vodden Street West

<Existing>AM
 06-01-2020

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 8 | 449 | 22 | 20 | 135 | 8 | 15 | 20 | 42 | 51 | 53 | 10 |
| Future Volume (vph) | 8 | 449 | 22 | 20 | 135 | 8 | 15 | 20 | 42 | 51 | 53 | 10 |
| 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) | 9 | 488 | 24 | 22 | 147 | 9 | 16 | 22 | 46 | 55 | 58 | 11 |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | | |
| Volume Total (vph) | 521 | 96 | 83 | 84 | 124 | | | | | | | |
| Volume Left (vph) | 9 | 22 | 0 | 16 | 55 | | | | | | | |
| Volume Right (vph) | 24 | 0 | 9 | 46 | 11 | | | | | | | |
| Hadj (s) | 0.04 | 0.23 | 0.05 | -0.27 | 0.13 | | | | | | | |
| Departure Headway (s) | 4.9 | 5.9 | 5.7 | 5.7 | 6.0 | | | | | | | |
| Degree Utilization, x | 0.71 | 0.16 | 0.13 | 0.13 | 0.20 | | | | | | | |
| Capacity (veh/h) | 521 | 567 | 588 | 547 | 537 | | | | | | | |
| Control Delay (s) | 19.3 | 8.8 | 8.4 | 9.5 | 10.5 | | | | | | | |
| Approach Delay (s) | 19.3 | 8.6 | | 9.5 | 10.5 | | | | | | | |
| Approach LOS | C | A | | A | B | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 15.1 | | | | | | | | | |
| Level of Service | | | C | | | | | | | | | |
| Intersection Capacity Utilization | | | 51.0% | ICU Level of Service | A | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 17: Lansdowne Drive/Lakeridge Drive & Vodden Street East

<Existing>AM
 06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↔↔ | | | ↔↔ | | | ↔ | | | ↔ | |
| Traffic Volume (veh/h) | 8 | 761 | 2 | 13 | 436 | 8 | 5 | 3 | 21 | 30 | 0 | 13 |
| Future Volume (Veh/h) | 8 | 761 | 2 | 13 | 436 | 8 | 5 | 3 | 21 | 30 | 0 | 13 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 9 | 827 | 2 | 14 | 474 | 9 | 5 | 3 | 23 | 33 | 0 | 14 |
| Pedestrians | | | | | 2 | | | 1 | | | 2 | |
| Lane Width (m) | | | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | | | | 0 | | | 0 | | | 0 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | 290 | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 485 | | | 830 | | | 1126 | 1360 | 418 | 966 | 1356 | 244 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 485 | | | 830 | | | 1126 | 1360 | 418 | 966 | 1356 | 244 |
| tC, single (s) | 4.4 | | | 4.3 | | | 7.5 | 7.2 | 6.9 | 7.5 | 6.5 | 7.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.3 | | | 2.3 | | | 3.5 | 4.3 | 3.3 | 3.5 | 4.0 | 3.5 |
| p0 queue free % | 99 | | | 98 | | | 97 | 97 | 96 | 83 | 100 | 98 |
| cM capacity (veh/h) | 999 | | | 760 | | | 155 | 109 | 588 | 194 | 143 | 715 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 422 | 416 | 251 | 246 | 31 | 47 | | | | | | |
| Volume Left | 9 | 0 | 14 | 0 | 5 | 33 | | | | | | |
| Volume Right | 0 | 2 | 0 | 9 | 23 | 14 | | | | | | |
| cSH | 999 | 1700 | 760 | 1700 | 313 | 248 | | | | | | |
| Volume to Capacity | 0.01 | 0.24 | 0.02 | 0.14 | 0.10 | 0.19 | | | | | | |
| Queue Length 95th (m) | 0.2 | 0.0 | 0.4 | 0.0 | 2.5 | 5.2 | | | | | | |
| Control Delay (s) | 0.3 | 0.0 | 0.7 | 0.0 | 17.7 | 22.9 | | | | | | |
| Lane LOS | A | | A | | C | C | | | | | | |
| Approach Delay (s) | 0.1 | | 0.4 | | 17.7 | 22.9 | | | | | | |
| Approach LOS | | | | | C | C | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 1.4 | | | | | | | | | |
| Intersection Capacity Utilization | | | 41.0% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 18: Howden Blvd & Lindridge Avenue/Leander Street

<Existing>AM
 06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↔ | | | ↔ | | | ↔ | | | ↔ | |
| Traffic Volume (veh/h) | 16 | 2 | 34 | 43 | 3 | 44 | 6 | 239 | 14 | 17 | 695 | 19 |
| Future Volume (Veh/h) | 16 | 2 | 34 | 43 | 3 | 44 | 6 | 239 | 14 | 17 | 695 | 19 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 17 | 2 | 37 | 47 | 3 | 48 | 7 | 260 | 15 | 18 | 755 | 21 |
| Pedestrians | | 6 | | | 5 | | | | | | | 4 |
| Lane Width (m) | | 3.7 | | | 3.7 | | | | | | | 3.7 |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | | | | | 1.1 |
| Percent Blockage | | 1 | | | 0 | | | | | | | 0 |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | | None |
| Median storage veh | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | 142 |
| pX, platoon unblocked | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | | 0.88 | | | | | |
| vC, conflicting volume | 1005 | 1102 | 394 | 738 | 1104 | 146 | 782 | | | 280 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 725 | 835 | 28 | 421 | 839 | 146 | 471 | | | 280 | | |
| tC, single (s) | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 93 | 99 | 96 | 89 | 99 | 95 | 99 | | | 99 | | |
| cM capacity (veh/h) | 251 | 260 | 913 | 424 | 259 | 873 | 961 | | | 1288 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 56 | 98 | 137 | 145 | 396 | 398 | | | | | | |
| Volume Left | 17 | 47 | 7 | 0 | 18 | 0 | | | | | | |
| Volume Right | 37 | 48 | 0 | 15 | 0 | 21 | | | | | | |
| cSH | 483 | 552 | 961 | 1700 | 1288 | 1700 | | | | | | |
| Volume to Capacity | 0.12 | 0.18 | 0.01 | 0.09 | 0.01 | 0.23 | | | | | | |
| Queue Length 95th (m) | 3.0 | 4.9 | 0.2 | 0.0 | 0.3 | 0.0 | | | | | | |
| Control Delay (s) | 13.4 | 12.9 | 0.5 | 0.0 | 0.5 | 0.0 | | | | | | |
| Lane LOS | B | B | A | | A | | | | | | | |
| Approach Delay (s) | 13.4 | 12.9 | 0.2 | | 0.2 | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 1.9 | | | | | | | | | |
| Intersection Capacity Utilization | | | 47.7% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 19: Hanover Road & Homeland Ct/Huntington Ct

<Existing>AM
 06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Traffic Volume (veh/h) | 15 | 0 | 5 | 10 | 0 | 12 | 2 | 173 | 6 | 7 | 220 | 7 |
| Future Volume (Veh/h) | 15 | 0 | 5 | 10 | 0 | 12 | 2 | 173 | 6 | 7 | 220 | 7 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 16 | 0 | 5 | 11 | 0 | 13 | 2 | 188 | 7 | 8 | 239 | 8 |
| Pedestrians | | 29 | | | 28 | | | 60 | | | 1 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 3 | | | 3 | | | 6 | | | 0 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage veh | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | 205 | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 400 | 515 | 212 | 424 | 516 | 126 | 276 | | | 223 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 400 | 515 | 212 | 424 | 516 | 126 | 276 | | | 223 | | |
| tC, single (s) | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 97 | 100 | 99 | 98 | 100 | 99 | 100 | | | 99 | | |
| cM capacity (veh/h) | 493 | 434 | 734 | 452 | 434 | 882 | 1263 | | | 1322 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 21 | 24 | 96 | 101 | 128 | 128 | | | | | | |
| Volume Left | 16 | 11 | 2 | 0 | 8 | 0 | | | | | | |
| Volume Right | 5 | 13 | 0 | 7 | 0 | 8 | | | | | | |
| cSH | 535 | 614 | 1263 | 1700 | 1322 | 1700 | | | | | | |
| Volume to Capacity | 0.04 | 0.04 | 0.00 | 0.06 | 0.01 | 0.07 | | | | | | |
| Queue Length 95th (m) | 0.9 | 0.9 | 0.0 | 0.0 | 0.1 | 0.0 | | | | | | |
| Control Delay (s) | 12.0 | 11.1 | 0.2 | 0.0 | 0.5 | 0.0 | | | | | | |
| Lane LOS | B | B | A | | A | | | | | | | |
| Approach Delay (s) | 12.0 | 11.1 | 0.1 | | 0.3 | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 1.2 | | | | | | | | | |
| Intersection Capacity Utilization | | | 31.3% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

Timings
7: Rutherford Road North & Vodden Street East

<Existing>AM
06-01-2020



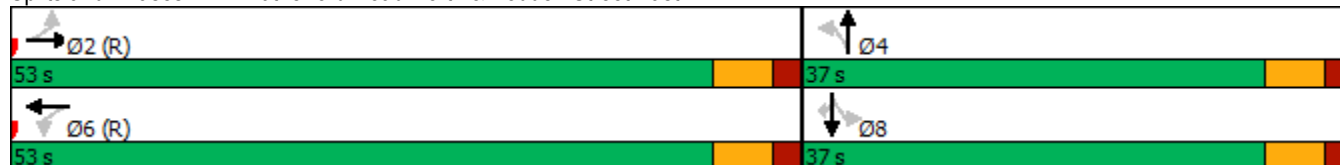
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ |
| Traffic Volume (vph) | 114 | 446 | 67 | 346 | 73 | 152 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 67 | 346 | 73 | 152 | 92 | 406 | 126 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | 6 | | 4 | | 8 | |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | | 8 |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 53.0 | 53.0 | 53.0 | 53.0 | 37.0 | 37.0 | 37.0 | 37.0 | 37.0 |
| Total Split (%) | 58.9% | 58.9% | 58.9% | 58.9% | 41.1% | 41.1% | 41.1% | 41.1% | 41.1% |
| Yellow Time (s) | 4.0 | 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 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 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 | 6.0 |
| Lead/Lag | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 51.0 | 51.0 | 51.0 | 51.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Actuated g/C Ratio | 0.57 | 0.57 | 0.57 | 0.57 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| v/c Ratio | 0.25 | 0.35 | 0.18 | 0.23 | 0.56 | 0.38 | 0.31 | 0.76 | 0.24 |
| Control Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| LOS | B | B | B | B | D | C | C | D | A |
| Approach Delay | | 13.4 | | 11.0 | | 29.1 | | 29.3 | |
| Approach LOS | | B | | B | | C | | C | |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.76
 Intersection Signal Delay: 19.5
 Intersection Capacity Utilization 80.7%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 7: Rutherford Road North & Vodden Street East



Queues

<Existing>AM

7: Rutherford Road North & Vodden Street East

06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|------------------------|------|-------|------|-------|------|-------|------|-------|------|
| Lane Group Flow (vph) | 119 | 667 | 70 | 432 | 76 | 200 | 96 | 423 | 131 |
| v/c Ratio | 0.25 | 0.35 | 0.18 | 0.23 | 0.56 | 0.38 | 0.31 | 0.76 | 0.24 |
| Control Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 15.4 | 13.0 | 13.2 | 10.7 | 42.3 | 24.1 | 25.9 | 37.5 | 5.3 |
| Queue Length 50th (m) | 13.2 | 35.5 | 7.3 | 21.9 | 10.7 | 24.1 | 12.4 | 64.1 | 0.1 |
| Queue Length 95th (m) | 27.3 | 51.4 | 17.6 | 35.0 | 25.1 | 40.3 | 24.1 | 92.7 | 11.4 |
| Internal Link Dist (m) | | 358.4 | | 418.5 | | 288.8 | | 340.1 | |
| Turn Bay Length (m) | 50.0 | | 48.5 | | 47.5 | | 41.5 | | 44.5 |
| Base Capacity (vph) | 479 | 1921 | 380 | 1896 | 156 | 602 | 356 | 641 | 601 |
| 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 | 0.25 | 0.35 | 0.18 | 0.23 | 0.49 | 0.33 | 0.27 | 0.66 | 0.22 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis
7: Rutherford Road North & Vodden Street East

<Existing>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|------|------|------|-------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | ↖ |
| Traffic Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Frbp, ped/bikes | 1.00 | 0.98 | | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 1.00 | 0.98 |
| Flpb, ped/bikes | 0.96 | 1.00 | | 0.98 | 1.00 | | 0.99 | 1.00 | | 0.97 | 1.00 | 1.00 |
| Frft | 1.00 | 0.95 | | 1.00 | 0.97 | | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1606 | 3302 | | 1720 | 3317 | | 1651 | 1721 | | 1673 | 1861 | 1499 |
| Flt Permitted | 0.50 | 1.00 | | 0.37 | 1.00 | | 0.26 | 1.00 | | 0.59 | 1.00 | 1.00 |
| Satd. Flow (perm) | 847 | 3302 | | 672 | 3317 | | 453 | 1721 | | 1036 | 1861 | 1499 |
| Peak-hour factor, PHF | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 |
| Adj. Flow (vph) | 119 | 465 | 202 | 70 | 360 | 72 | 76 | 158 | 42 | 96 | 423 | 131 |
| RTOR Reduction (vph) | 0 | 49 | 0 | 0 | 17 | 0 | 0 | 11 | 0 | 0 | 0 | 91 |
| Lane Group Flow (vph) | 119 | 618 | 0 | 70 | 415 | 0 | 76 | 189 | 0 | 96 | 423 | 40 |
| Confl. Peds. (#/hr) | 45 | | 31 | 31 | | 45 | 13 | | 37 | 37 | | 13 |
| Heavy Vehicles (%) | 7% | 3% | 3% | 2% | 6% | 2% | 10% | 6% | 5% | 4% | 2% | 4% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 3 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 51.0 | 51.0 | | 51.0 | 51.0 | | 27.0 | 27.0 | | 27.0 | 27.0 | 27.0 |
| Effective Green, g (s) | 51.0 | 51.0 | | 51.0 | 51.0 | | 27.0 | 27.0 | | 27.0 | 27.0 | 27.0 |
| Actuated g/C Ratio | 0.57 | 0.57 | | 0.57 | 0.57 | | 0.30 | 0.30 | | 0.30 | 0.30 | 0.30 |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 479 | 1871 | | 380 | 1879 | | 135 | 516 | | 310 | 558 | 449 |
| v/s Ratio Prot | | c0.19 | | | 0.13 | | | 0.11 | | | c0.23 | |
| v/s Ratio Perm | 0.14 | | | 0.10 | | | 0.17 | | | 0.09 | | 0.03 |
| v/c Ratio | 0.25 | 0.33 | | 0.18 | 0.22 | | 0.56 | 0.37 | | 0.31 | 0.76 | 0.09 |
| Uniform Delay, d1 | 9.8 | 10.4 | | 9.4 | 9.7 | | 26.5 | 24.8 | | 24.3 | 28.5 | 22.7 |
| Progression Factor | 1.23 | 1.35 | | 1.06 | 1.09 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.2 | 0.4 | | 1.0 | 0.3 | | 8.6 | 0.9 | | 1.2 | 6.9 | 0.2 |
| Delay (s) | 13.3 | 14.5 | | 11.0 | 10.8 | | 35.1 | 25.7 | | 25.5 | 35.5 | 22.8 |
| Level of Service | B | B | | B | B | | D | C | | C | D | C |
| Approach Delay (s) | | 14.3 | | | 10.8 | | | 28.3 | | | 31.5 | |
| Approach LOS | | B | | | B | | | C | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 20.3 | | | | HCM 2000 Level of Service | | | C | | |
| HCM 2000 Volume to Capacity ratio | | | 0.48 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | Sum of lost time (s) | | | 12.0 | | |
| Intersection Capacity Utilization | | | 80.7% | | | | ICU Level of Service | | | D | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

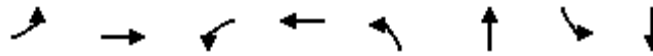
c Critical Lane Group

Timings

<Existing>PM

1: Main Street & Vodden Street West/Vodden Street East

03-11-2020

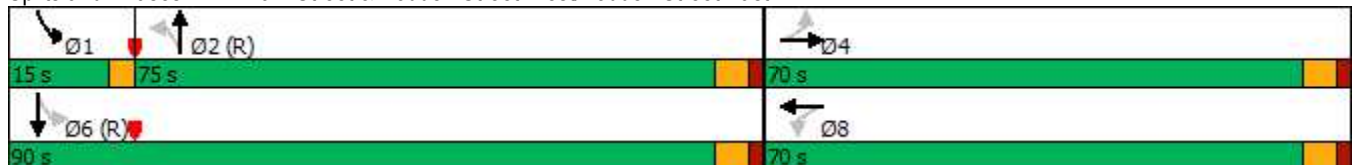


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↙ | ↕ | ↙ | ↕ | ↙ | ↕ | ↙ | ↕ |
| Traffic Volume (vph) | 44 | 298 | 169 | 427 | 85 | 972 | 162 | 585 |
| Future Volume (vph) | 44 | 298 | 169 | 427 | 85 | 972 | 162 | 585 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | pm+pt | NA |
| Protected Phases | | 4 | | 8 | | 2 | 1 | 6 |
| Permitted Phases | 4 | | 8 | | 2 | | 6 | |
| Detector Phase | 4 | 4 | 8 | 8 | 2 | 2 | 1 | 6 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 |
| Minimum Split (s) | 25.0 | 25.0 | 25.0 | 25.0 | 27.0 | 27.0 | 9.0 | 27.0 |
| Total Split (s) | 70.0 | 70.0 | 70.0 | 70.0 | 75.0 | 75.0 | 15.0 | 90.0 |
| Total Split (%) | 43.8% | 43.8% | 43.8% | 43.8% | 46.9% | 46.9% | 9.4% | 56.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 3.0 | 6.0 |
| Lead/Lag | | | | | Lag | Lag | Lead | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | C-Max | C-Max | None | C-Max |
| Act Effct Green (s) | 61.5 | 61.5 | 61.5 | 61.5 | 72.1 | 72.1 | 89.5 | 86.5 |
| Actuated g/C Ratio | 0.38 | 0.38 | 0.38 | 0.38 | 0.45 | 0.45 | 0.56 | 0.54 |
| v/c Ratio | 0.73 | 0.28 | 0.59 | 0.93 | 0.31 | 0.76 | 0.78 | 0.35 |
| Control Delay | 96.0 | 33.0 | 47.5 | 67.6 | 33.0 | 40.9 | 44.3 | 21.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 96.0 | 33.0 | 47.5 | 69.0 | 33.0 | 40.9 | 44.3 | 21.8 |
| LOS | F | C | D | E | C | D | D | C |
| Approach Delay | | 40.1 | | 64.2 | | 40.3 | | 26.6 |
| Approach LOS | | D | | E | | D | | C |

Intersection Summary

Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 79 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 42.8
 Intersection LOS: D
 Intersection Capacity Utilization 97.5%
 ICU Level of Service F
 Analysis Period (min) 15

Splits and Phases: 1: Main Street & Vodden Street West/Vodden Street East

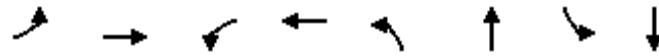


Queues

<Existing>PM

1: Main Street & Vodden Street West/Vodden Street East

03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|-------|------|------|--------|------|-------|-------|-------|
| Lane Group Flow (vph) | 48 | 376 | 184 | 638 | 92 | 1160 | 176 | 656 |
| v/c Ratio | 0.73 | 0.28 | 0.59 | 0.93 | 0.31 | 0.76 | 0.78 | 0.35 |
| Control Delay | 96.0 | 33.0 | 47.5 | 67.6 | 33.0 | 40.9 | 44.3 | 21.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 96.0 | 33.0 | 47.5 | 69.0 | 33.0 | 40.9 | 44.3 | 21.8 |
| Queue Length 50th (m) | 12.6 | 40.6 | 45.2 | 185.9 | 19.2 | 165.1 | 27.6 | 62.6 |
| Queue Length 95th (m) | #37.8 | 53.4 | 73.0 | #258.8 | 34.8 | 193.4 | #58.6 | 76.6 |
| Internal Link Dist (m) | | 98.5 | | 228.5 | | 261.4 | | 232.7 |
| Turn Bay Length (m) | 42.0 | | | | 48.5 | | 22.5 | |
| Base Capacity (vph) | 69 | 1377 | 325 | 710 | 298 | 1536 | 232 | 1877 |
| Starvation Cap Reductn | 0 | 0 | 0 | 16 | 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 | 0.70 | 0.27 | 0.57 | 0.92 | 0.31 | 0.76 | 0.76 | 0.35 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 1: Main Street & Vodden Street West/Vodden Street East

<Existing>PM
 03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|------|-------|------|------|------|------|-------|------|------|
| Lane Configurations | ↙ | ↕ | | ↙ | ↕ | | ↙ | ↕ | | ↙ | ↕ | |
| Traffic Volume (vph) | 44 | 298 | 48 | 169 | 427 | 160 | 85 | 972 | 95 | 162 | 585 | 18 |
| Future Volume (vph) | 44 | 298 | 48 | 169 | 427 | 160 | 85 | 972 | 95 | 162 | 585 | 18 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.97 | | 1.00 | 0.96 | | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 0.91 | 1.00 | | 0.91 | 1.00 | | 1.00 | 1.00 | |
| Frft | 1.00 | 0.98 | | 1.00 | 0.96 | | 1.00 | 0.99 | | 1.00 | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1785 | 3424 | | 1626 | 1756 | | 1564 | 3396 | | 1785 | 3473 | |
| Flt Permitted | 0.09 | 1.00 | | 0.48 | 1.00 | | 0.40 | 1.00 | | 0.11 | 1.00 | |
| Satd. Flow (perm) | 173 | 3424 | | 814 | 1756 | | 662 | 3396 | | 202 | 3473 | |
| 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) | 48 | 324 | 52 | 184 | 464 | 174 | 92 | 1057 | 103 | 176 | 636 | 20 |
| RTOR Reduction (vph) | 0 | 8 | 0 | 0 | 9 | 0 | 0 | 4 | 0 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 48 | 368 | 0 | 184 | 629 | 0 | 92 | 1156 | 0 | 176 | 655 | 0 |
| Confl. Peds. (#/hr) | 47 | | 71 | 71 | | 47 | 58 | | 62 | 62 | | 58 |
| Heavy Vehicles (%) | 0% | 1% | 3% | 0% | 1% | 2% | 4% | 3% | 0% | 0% | 4% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | pm+pt | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | 61.5 | 61.5 | | 61.5 | 61.5 | | 72.2 | 72.2 | | 86.5 | 86.5 | |
| Effective Green, g (s) | 61.5 | 61.5 | | 61.5 | 61.5 | | 72.2 | 72.2 | | 86.5 | 86.5 | |
| Actuated g/C Ratio | 0.38 | 0.38 | | 0.38 | 0.38 | | 0.45 | 0.45 | | 0.54 | 0.54 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 66 | 1316 | | 312 | 674 | | 298 | 1532 | | 221 | 1877 | |
| v/s Ratio Prot | | 0.11 | | | c0.36 | | | 0.34 | | c0.06 | 0.19 | |
| v/s Ratio Perm | 0.28 | | | 0.23 | | | 0.14 | | | c0.37 | | |
| v/c Ratio | 0.73 | 0.28 | | 0.59 | 0.93 | | 0.31 | 0.75 | | 0.80 | 0.35 | |
| Uniform Delay, d1 | 42.1 | 34.0 | | 39.2 | 47.3 | | 28.0 | 36.5 | | 27.7 | 20.8 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 38.7 | 0.2 | | 4.4 | 20.7 | | 2.7 | 3.5 | | 17.8 | 0.5 | |
| Delay (s) | 80.8 | 34.2 | | 43.6 | 68.0 | | 30.7 | 40.0 | | 45.5 | 21.3 | |
| Level of Service | F | C | | D | E | | C | D | | D | C | |
| Approach Delay (s) | | 39.5 | | | 62.5 | | | 39.3 | | | 26.4 | |
| Approach LOS | | D | | | E | | | D | | | C | |

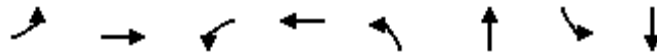
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 41.8 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 0.87 | | |
| Actuated Cycle Length (s) | 160.0 | Sum of lost time (s) | 15.0 |
| Intersection Capacity Utilization | 97.5% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
2: Ken Whillans Drive/Private Access & Vodden Street East

<Existing>PM
03-11-2020

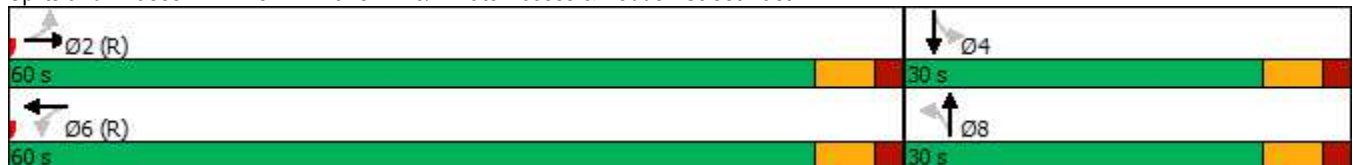


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↔↔ | | ↔↔ | ↔ | ↔ | | ↔↔ |
| Traffic Volume (vph) | 44 | 554 | 49 | 878 | 64 | 2 | 32 | 3 |
| Future Volume (vph) | 44 | 554 | 49 | 878 | 64 | 2 | 32 | 3 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 2 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 26.0 | 26.0 | 26.0 | 26.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 60.0 | 60.0 | 60.0 | 60.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 66.7% | 66.7% | 66.7% | 66.7% | 33.3% | 33.3% | 33.3% | 33.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | | 69.8 | | 69.8 | 12.2 | 12.2 | | 12.2 |
| Actuated g/C Ratio | | 0.78 | | 0.78 | 0.14 | 0.14 | | 0.14 |
| v/c Ratio | | 0.32 | | 0.43 | 0.40 | 0.25 | | 0.22 |
| Control Delay | | 4.6 | | 11.1 | 41.1 | 11.5 | | 18.0 |
| Queue Delay | | 0.0 | | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | | 4.6 | | 11.1 | 41.1 | 11.5 | | 18.0 |
| LOS | | A | | B | D | B | | B |
| Approach Delay | | 4.6 | | 11.1 | | 26.4 | | 18.0 |
| Approach LOS | | A | | B | | C | | B |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.43
 Intersection Signal Delay: 10.1
 Intersection Capacity Utilization 72.9%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 2: Ken Whillans Drive/Private Access & Vodden Street East





| Lane Group | EBT | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|------|------|------|
| Lane Group Flow (vph) | 708 | 1040 | 70 | 69 | 88 |
| v/c Ratio | 0.32 | 0.43 | 0.40 | 0.25 | 0.22 |
| Control Delay | 4.6 | 11.1 | 41.1 | 11.5 | 18.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 4.6 | 11.1 | 41.1 | 11.5 | 18.0 |
| Queue Length 50th (m) | 18.2 | 62.5 | 11.3 | 0.3 | 3.1 |
| Queue Length 95th (m) | 31.4 | 86.1 | 22.5 | 10.9 | 9.1 |
| Internal Link Dist (m) | 228.5 | 397.8 | | 93.7 | 45.6 |
| Turn Bay Length (m) | | | 29.0 | | |
| Base Capacity (vph) | 2234 | 2424 | 349 | 478 | 750 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.32 | 0.43 | 0.20 | 0.14 | 0.12 |
| Intersection Summary | | | | | |

HCM Signalized Intersection Capacity Analysis
 2: Ken Whillans Drive/Private Access & Vodden Street East

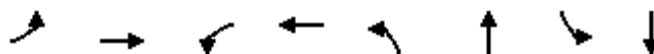
<Existing>PM
 03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|-------|------|---------------------------|------|------|------|------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | ↕ | ↕ | | | ↕↕ | |
| Traffic Volume (vph) | 44 | 554 | 53 | 49 | 878 | 30 | 64 | 2 | 62 | 32 | 3 | 46 |
| Future Volume (vph) | 44 | 554 | 53 | 49 | 878 | 30 | 64 | 2 | 62 | 32 | 3 | 46 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | 1.00 | 1.00 | | | 0.95 | |
| Frbp, ped/bikes | | 1.00 | | | 1.00 | | 1.00 | 0.98 | | | 0.98 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | 0.98 | 1.00 | | | 1.00 | |
| Frt | | 0.99 | | | 1.00 | | 1.00 | 0.85 | | | 0.91 | |
| Flt Protected | | 1.00 | | | 1.00 | | 0.95 | 1.00 | | | 0.98 | |
| Satd. Flow (prot) | | 3503 | | | 3563 | | 1784 | 1612 | | | 3197 | |
| Flt Permitted | | 0.82 | | | 0.88 | | 0.70 | 1.00 | | | 0.82 | |
| Satd. Flow (perm) | | 2873 | | | 3127 | | 1308 | 1612 | | | 2675 | |
| 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) | 48 | 602 | 58 | 53 | 954 | 33 | 70 | 2 | 67 | 35 | 3 | 50 |
| RTOR Reduction (vph) | 0 | 5 | 0 | 0 | 2 | 0 | 0 | 59 | 0 | 0 | 44 | 0 |
| Lane Group Flow (vph) | 0 | 703 | 0 | 0 | 1038 | 0 | 70 | 10 | 0 | 0 | 44 | 0 |
| Confl. Peds. (#/hr) | 12 | | 14 | 14 | | 12 | 20 | | 5 | 5 | | 20 |
| Heavy Vehicles (%) | 0% | 2% | 0% | 3% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 8 | | | | 4 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | | 67.4 | | | 67.4 | | 10.6 | 10.6 | | | | 10.6 |
| Effective Green, g (s) | | 67.4 | | | 67.4 | | 10.6 | 10.6 | | | | 10.6 |
| Actuated g/C Ratio | | 0.75 | | | 0.75 | | 0.12 | 0.12 | | | | 0.12 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | | 6.0 |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | 5.0 | 5.0 | | | | 5.0 |
| Lane Grp Cap (vph) | | 2151 | | | 2341 | | 154 | 189 | | | | 315 |
| v/s Ratio Prot | | | | | | | | 0.01 | | | | |
| v/s Ratio Perm | | 0.24 | | | c0.33 | | c0.05 | | | | | 0.02 |
| v/c Ratio | | 0.33 | | | 0.44 | | 0.45 | 0.05 | | | | 0.14 |
| Uniform Delay, d1 | | 3.8 | | | 4.2 | | 37.0 | 35.2 | | | | 35.6 |
| Progression Factor | | 1.00 | | | 2.16 | | 1.00 | 1.00 | | | | 1.00 |
| Incremental Delay, d2 | | 0.4 | | | 0.6 | | 4.4 | 0.2 | | | | 0.4 |
| Delay (s) | | 4.2 | | | 9.7 | | 41.4 | 35.5 | | | | 36.0 |
| Level of Service | | A | | | A | | D | D | | | | D |
| Approach Delay (s) | | 4.2 | | | 9.7 | | | 38.5 | | | | 36.0 |
| Approach LOS | | A | | | A | | | D | | | | D |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 10.9 | | | | HCM 2000 Level of Service | | | | B | |
| HCM 2000 Volume to Capacity ratio | | | 0.44 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | Sum of lost time (s) | | | 12.0 | | |
| Intersection Capacity Utilization | | | 72.9% | | | | ICU Level of Service | | | | C | |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings
3: Centre Street North & Vodden Street East

<Existing>PM
03-11-2020



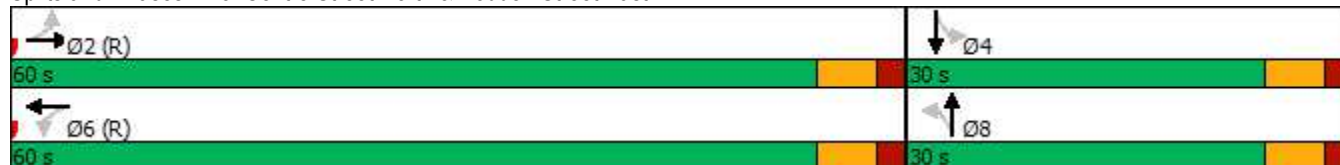
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ |
| Traffic Volume (vph) | 146 | 508 | 60 | 762 | 122 | 358 | 40 | 143 |
| Future Volume (vph) | 146 | 508 | 60 | 762 | 122 | 358 | 40 | 143 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 2 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 28.0 | 28.0 | 28.0 | 28.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| Total Split (s) | 60.0 | 60.0 | 60.0 | 60.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 66.7% | 66.7% | 66.7% | 66.7% | 33.3% | 33.3% | 33.3% | 33.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 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? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 54.0 | 54.0 | 54.0 | 54.0 | 24.0 | 24.0 | 24.0 | 24.0 |
| Actuated g/C Ratio | 0.60 | 0.60 | 0.60 | 0.60 | 0.27 | 0.27 | 0.27 | 0.27 |
| v/c Ratio | 0.54 | 0.30 | 0.15 | 0.44 | 0.46 | 0.95 | 0.52 | 0.28 |
| Control Delay | 16.5 | 6.2 | 8.4 | 9.3 | 33.9 | 62.5 | 53.5 | 15.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 16.5 | 6.2 | 8.4 | 9.3 | 33.9 | 62.5 | 53.5 | 15.0 |
| LOS | B | A | A | A | C | E | D | B |
| Approach Delay | | 8.3 | | 9.2 | | 56.3 | | 20.0 |
| Approach LOS | | A | | A | | E | | C |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 61 (68%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.95
 Intersection Signal Delay: 20.7
 Intersection Capacity Utilization 82.7%
 Analysis Period (min) 15

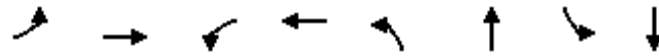
Intersection LOS: C
 ICU Level of Service E

Splits and Phases: 3: Centre Street North & Vodden Street East



Queues
3: Centre Street North & Vodden Street East

<Existing>PM
03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|------|-------|------|--------|-------|-------|
| Lane Group Flow (vph) | 159 | 640 | 65 | 933 | 133 | 475 | 43 | 282 |
| v/c Ratio | 0.54 | 0.30 | 0.15 | 0.44 | 0.46 | 0.95 | 0.52 | 0.28 |
| Control Delay | 16.5 | 6.2 | 8.4 | 9.3 | 33.9 | 62.5 | 53.5 | 15.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 16.5 | 6.2 | 8.4 | 9.3 | 33.9 | 62.5 | 53.5 | 15.0 |
| Queue Length 50th (m) | 15.3 | 25.3 | 4.5 | 40.8 | 19.2 | 78.7 | 6.3 | 10.8 |
| Queue Length 95th (m) | 26.5 | 15.6 | 8.2 | 35.7 | 36.7 | #137.9 | #21.2 | 20.6 |
| Internal Link Dist (m) | | 397.8 | | 166.8 | | 100.6 | | 129.3 |
| Turn Bay Length (m) | 47.0 | | 59.5 | | 44.0 | | 35.5 | |
| Base Capacity (vph) | 297 | 2125 | 439 | 2129 | 287 | 501 | 83 | 990 |
| 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 | 0.54 | 0.30 | 0.15 | 0.44 | 0.46 | 0.95 | 0.52 | 0.28 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

3: Centre Street North & Vodden Street East

<Existing>PM
03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|------|------|------|------|------|------|-------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 146 | 508 | 81 | 60 | 762 | 97 | 122 | 358 | 79 | 40 | 143 | 117 |
| Future Volume (vph) | 146 | 508 | 81 | 60 | 762 | 97 | 122 | 358 | 79 | 40 | 143 | 117 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| 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 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.98 | | 1.00 | 0.98 | | 1.00 | 0.97 | | 1.00 | 0.93 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1782 | 3521 | | 1780 | 3532 | | 1767 | 1848 | | 1782 | 3367 | |
| Flt Permitted | 0.26 | 1.00 | | 0.39 | 1.00 | | 0.58 | 1.00 | | 0.17 | 1.00 | |
| Satd. Flow (perm) | 495 | 3521 | | 733 | 3532 | | 1077 | 1848 | | 313 | 3367 | |
| 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) | 159 | 552 | 88 | 65 | 828 | 105 | 133 | 389 | 86 | 43 | 155 | 127 |
| RTOR Reduction (vph) | 0 | 14 | 0 | 0 | 11 | 0 | 0 | 9 | 0 | 0 | 93 | 0 |
| Lane Group Flow (vph) | 159 | 626 | 0 | 65 | 922 | 0 | 133 | 466 | 0 | 43 | 189 | 0 |
| Confl. Peds. (#/hr) | 4 | | 6 | 6 | | 4 | | | 4 | 4 | | |
| Heavy Vehicles (%) | 0% | 1% | 0% | 0% | 1% | 0% | 1% | 1% | 0% | 0% | 2% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 54.0 | 54.0 | | 54.0 | 54.0 | | 24.0 | 24.0 | | 24.0 | 24.0 | |
| Effective Green, g (s) | 54.0 | 54.0 | | 54.0 | 54.0 | | 24.0 | 24.0 | | 24.0 | 24.0 | |
| Actuated g/C Ratio | 0.60 | 0.60 | | 0.60 | 0.60 | | 0.27 | 0.27 | | 0.27 | 0.27 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 297 | 2112 | | 439 | 2119 | | 287 | 492 | | 83 | 897 | |
| v/s Ratio Prot | | 0.18 | | | 0.26 | | | c0.25 | | | 0.06 | |
| v/s Ratio Perm | c0.32 | | | 0.09 | | | 0.12 | | | 0.14 | | |
| v/c Ratio | 0.54 | 0.30 | | 0.15 | 0.44 | | 0.46 | 0.95 | | 0.52 | 0.21 | |
| Uniform Delay, d1 | 10.6 | 8.8 | | 7.9 | 9.7 | | 27.6 | 32.4 | | 28.1 | 25.6 | |
| Progression Factor | 0.81 | 0.71 | | 0.93 | 0.90 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 6.6 | 0.4 | | 0.7 | 0.6 | | 2.5 | 28.3 | | 10.5 | 0.2 | |
| Delay (s) | 15.2 | 6.5 | | 8.1 | 9.4 | | 30.1 | 60.7 | | 38.5 | 25.9 | |
| Level of Service | B | A | | A | A | | C | E | | D | C | |
| Approach Delay (s) | | 8.3 | | | 9.3 | | | 54.0 | | | 27.6 | |
| Approach LOS | | A | | | A | | | D | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 21.1 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.66 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 82.7% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
4: Post Road/School Access & Vodden Street East

<Existing>PM
03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↕↕ | | ↕↕ | | ↕↕ | | ↑ | ↗ |
| Traffic Volume (vph) | 3 | 608 | 1 | 951 | 2 | 0 | 5 | 0 | 11 |
| Future Volume (vph) | 3 | 608 | 1 | 951 | 2 | 0 | 5 | 0 | 11 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | 2 | | 4 | | 4 | |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | | 4 |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 | 26.0 |
| Total Split (s) | 60.0 | 60.0 | 60.0 | 60.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 66.7% | 66.7% | 66.7% | 66.7% | 33.3% | 33.3% | 33.3% | 33.3% | 33.3% |
| Yellow Time (s) | 4.0 | 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 | 2.0 |
| Lost Time Adjust (s) | | 0.0 | | 0.0 | | 0.0 | | 0.0 | 0.0 |
| Total Lost Time (s) | | 6.0 | | 6.0 | | 6.0 | | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | | 81.8 | | 81.8 | | 8.2 | | 8.2 | 8.2 |
| Actuated g/C Ratio | | 0.91 | | 0.91 | | 0.09 | | 0.09 | 0.09 |
| v/c Ratio | | 0.22 | | 0.33 | | 0.03 | | 0.03 | 0.07 |
| Control Delay | | 0.8 | | 2.0 | | 0.4 | | 37.4 | 2.6 |
| Queue Delay | | 0.0 | | 0.0 | | 0.0 | | 0.0 | 0.0 |
| Total Delay | | 0.8 | | 2.0 | | 0.4 | | 37.4 | 2.6 |
| LOS | | A | | A | | A | | D | A |
| Approach Delay | | 0.8 | | 2.0 | | 0.4 | | 12.9 | |
| Approach LOS | | A | | A | | A | | B | |

Intersection Summary

| | |
|---|------------------------|
| Cycle Length: 90 | |
| Actuated Cycle Length: 90 | |
| Offset: 73 (81%), Referenced to phase 2:EBWB and 6:, Start of Green | |
| Natural Cycle: 55 | |
| Control Type: Actuated-Coordinated | |
| Maximum v/c Ratio: 0.33 | |
| Intersection Signal Delay: 1.7 | Intersection LOS: A |
| Intersection Capacity Utilization 57.2% | ICU Level of Service B |
| Analysis Period (min) 15 | |

Splits and Phases: 4: Post Road/School Access & Vodden Street East



4: Post Road/School Access & Vodden Street East

03-11-2020



| Lane Group | EBT | WBT | NBT | SBT | SBR |
|------------------------|-------|-------|-------|------|------|
| Lane Group Flow (vph) | 669 | 1043 | 5 | 5 | 12 |
| v/c Ratio | 0.22 | 0.33 | 0.03 | 0.03 | 0.07 |
| Control Delay | 0.8 | 2.0 | 0.4 | 37.4 | 2.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 0.8 | 2.0 | 0.4 | 37.4 | 2.6 |
| Queue Length 50th (m) | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 |
| Queue Length 95th (m) | m7.6 | 32.1 | 0.0 | 4.0 | 1.1 |
| Internal Link Dist (m) | 166.8 | 488.5 | 114.7 | 40.1 | |
| Turn Bay Length (m) | | | | | |
| Base Capacity (vph) | 3110 | 3119 | 429 | 506 | 452 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.22 | 0.33 | 0.01 | 0.01 | 0.03 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
4: Post Road/School Access & Vodden Street East

<Existing>PM
03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | | ↕ | | | ↑ | ↗ |
| Traffic Volume (vph) | 3 | 608 | 5 | 1 | 951 | 7 | 2 | 0 | 3 | 5 | 0 | 11 |
| Future Volume (vph) | 3 | 608 | 5 | 1 | 951 | 7 | 2 | 0 | 3 | 5 | 0 | 11 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.5 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 6.0 |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | 1.00 |
| Frbp, ped/bikes | | 1.00 | | | 1.00 | | | 0.99 | | | 1.00 | 1.00 |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 0.99 | 1.00 |
| Frt | | 1.00 | | | 1.00 | | | 0.92 | | | 1.00 | 0.85 |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.98 | | | 0.95 | 1.00 |
| Satd. Flow (prot) | | 3594 | | | 3595 | | | 1707 | | | 1805 | 1597 |
| Flt Permitted | | 0.95 | | | 0.95 | | | 0.87 | | | 1.00 | 1.00 |
| Satd. Flow (perm) | | 3423 | | | 3432 | | | 1511 | | | 1901 | 1597 |
| 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) | 3 | 661 | 5 | 1 | 1034 | 8 | 2 | 0 | 3 | 5 | 0 | 12 |
| RTOR Reduction (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 12 |
| Lane Group Flow (vph) | 0 | 669 | 0 | 0 | 1043 | 0 | 0 | 0 | 0 | 0 | 5 | 0 |
| Confl. Peds. (#/hr) | 3 | | 1 | 1 | | 3 | | | 8 | 8 | | |
| Heavy Vehicles (%) | 0% | 1% | 0% | 0% | 1% | 0% | 0% | 2% | 0% | 0% | 2% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | 4 |
| Actuated Green, G (s) | | 74.6 | | | 74.6 | | | 3.4 | | | 3.4 | 3.4 |
| Effective Green, g (s) | | 74.6 | | | 74.6 | | | 3.4 | | | 3.4 | 3.4 |
| Actuated g/C Ratio | | 0.83 | | | 0.83 | | | 0.04 | | | 0.04 | 0.04 |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | 6.0 |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | 5.0 |
| Lane Grp Cap (vph) | | 2837 | | | 2844 | | | 57 | | | 71 | 60 |
| v/s Ratio Prot | | | | | | | | | | | | |
| v/s Ratio Perm | | 0.20 | | | 0.30 | | | 0.00 | | | 0.00 | 0.00 |
| v/c Ratio | | 0.24 | | | 0.37 | | | 0.00 | | | 0.07 | 0.01 |
| Uniform Delay, d1 | | 1.6 | | | 1.9 | | | 41.7 | | | 41.8 | 41.7 |
| Progression Factor | | 0.46 | | | 1.00 | | | 1.00 | | | 1.00 | 1.00 |
| Incremental Delay, d2 | | 0.2 | | | 0.4 | | | 0.0 | | | 0.9 | 0.1 |
| Delay (s) | | 0.9 | | | 2.3 | | | 41.7 | | | 42.7 | 41.8 |
| Level of Service | | A | | | A | | | D | | | D | D |
| Approach Delay (s) | | 0.9 | | | 2.3 | | | 41.7 | | | 42.0 | |
| Approach LOS | | A | | | A | | | D | | | D | |

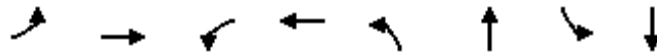
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 2.3 | HCM 2000 Level of Service | A |
| HCM 2000 Volume to Capacity ratio | 0.35 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 57.2% | ICU Level of Service | B |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
5: Kennedy Road North & Vodden Street East

<Existing>PM
03-11-2020



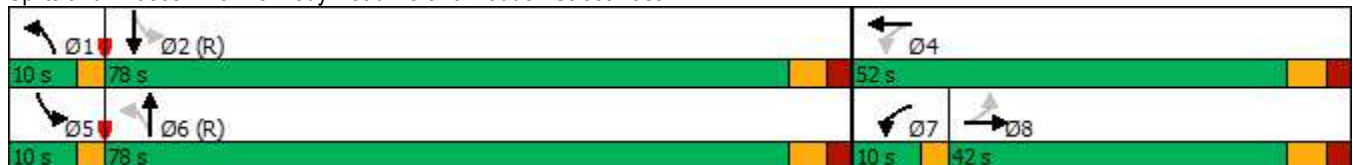
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ |
| Traffic Volume (vph) | 67 | 427 | 121 | 550 | 172 | 1136 | 137 | 641 |
| Future Volume (vph) | 67 | 427 | 121 | 550 | 172 | 1136 | 137 | 641 |
| Turn Type | Perm | NA | pm+pt | NA | pm+pt | NA | pm+pt | NA |
| Protected Phases | | 8 | 7 | 4 | 1 | 6 | 5 | 2 |
| Permitted Phases | 8 | | 4 | | 6 | | 2 | |
| Detector Phase | 8 | 8 | 7 | 4 | 1 | 6 | 5 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 |
| Minimum Split (s) | 40.8 | 40.8 | 8.0 | 40.8 | 8.0 | 39.7 | 8.0 | 39.7 |
| Total Split (s) | 42.0 | 42.0 | 10.0 | 52.0 | 10.0 | 78.0 | 10.0 | 78.0 |
| Total Split (%) | 30.0% | 30.0% | 7.1% | 37.1% | 7.1% | 55.7% | 7.1% | 55.7% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 0.0 | 2.8 | 0.0 | 2.7 | 0.0 | 2.7 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 3.0 | 6.8 | 3.0 | 6.7 | 3.0 | 6.7 |
| Lead/Lag | Lag | Lag | Lead | | Lead | Lag | Lead | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | | Yes | Yes | Yes | Yes |
| Recall Mode | None | None | None | None | None | C-Max | None | C-Max |
| Act Effct Green (s) | 31.5 | 31.5 | 45.3 | 41.5 | 85.7 | 75.0 | 85.7 | 75.0 |
| Actuated g/C Ratio | 0.22 | 0.22 | 0.32 | 0.30 | 0.61 | 0.54 | 0.61 | 0.54 |
| v/c Ratio | 0.93 | 0.68 | 0.62 | 0.80 | 0.42 | 0.67 | 0.63 | 0.39 |
| Control Delay | 138.9 | 52.0 | 48.4 | 48.0 | 14.7 | 26.3 | 24.7 | 20.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 138.9 | 52.0 | 48.4 | 48.0 | 14.7 | 26.3 | 24.7 | 20.1 |
| LOS | F | D | D | D | B | C | C | C |
| Approach Delay | | 61.8 | | 48.0 | | 24.9 | | 20.9 |
| Approach LOS | | E | | D | | C | | C |

Intersection Summary

Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 42 (30%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 35.6
 Intersection Capacity Utilization 96.4%
 Analysis Period (min) 15

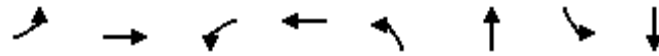
Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 5: Kennedy Road North & Vodden Street East



Queues
5: Kennedy Road North & Vodden Street East

<Existing>PM
03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|-------|-------|------|-------|------|-------|------|-------|
| Lane Group Flow (vph) | 69 | 546 | 125 | 831 | 177 | 1269 | 141 | 723 |
| v/c Ratio | 0.93 | 0.68 | 0.62 | 0.80 | 0.42 | 0.67 | 0.63 | 0.39 |
| Control Delay | 138.9 | 52.0 | 48.4 | 48.0 | 14.7 | 26.3 | 24.7 | 20.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 138.9 | 52.0 | 48.4 | 48.0 | 14.7 | 26.3 | 24.7 | 20.1 |
| Queue Length 50th (m) | 18.2 | 68.3 | 24.2 | 100.5 | 20.4 | 137.3 | 15.9 | 62.6 |
| Queue Length 95th (m) | #47.3 | 87.7 | 39.6 | 124.4 | 31.4 | 162.5 | 25.5 | 77.7 |
| Internal Link Dist (m) | | 488.5 | | 191.2 | | 129.6 | | 496.7 |
| Turn Bay Length (m) | 52.0 | | 43.5 | | 58.0 | | 79.5 | |
| Base Capacity (vph) | 83 | 889 | 202 | 1132 | 423 | 1889 | 223 | 1861 |
| 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 | 0.83 | 0.61 | 0.62 | 0.73 | 0.42 | 0.67 | 0.63 | 0.39 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Kennedy Road North & Vodden Street East

<Existing>PM
03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|------|------|-------|-------|------|-------|-------|------|-------|------|------|
| Lane Configurations | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | |
| Traffic Volume (vph) | 67 | 427 | 103 | 121 | 550 | 256 | 172 | 1136 | 95 | 137 | 641 | 60 |
| Future Volume (vph) | 67 | 427 | 103 | 121 | 550 | 256 | 172 | 1136 | 95 | 137 | 641 | 60 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 0.98 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.97 | | 1.00 | 0.95 | | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1764 | 3478 | | 1746 | 3388 | | 1763 | 3522 | | 1784 | 3470 | |
| Flt Permitted | 0.18 | 1.00 | | 0.23 | 1.00 | | 0.32 | 1.00 | | 0.13 | 1.00 | |
| Satd. Flow (perm) | 333 | 3478 | | 422 | 3388 | | 599 | 3522 | | 238 | 3470 | |
| Peak-hour factor, PHF | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Adj. Flow (vph) | 69 | 440 | 106 | 125 | 567 | 264 | 177 | 1171 | 98 | 141 | 661 | 62 |
| RTOR Reduction (vph) | 0 | 16 | 0 | 0 | 41 | 0 | 0 | 4 | 0 | 0 | 5 | 0 |
| Lane Group Flow (vph) | 69 | 531 | 0 | 125 | 790 | 0 | 177 | 1265 | 0 | 141 | 718 | 0 |
| Confl. Peds. (#/hr) | 38 | | 27 | 27 | | 38 | 23 | | 28 | 28 | | 23 |
| Confl. Bikes (#/hr) | | | | | | 1 | | | | | | |
| Heavy Vehicles (%) | 0% | 1% | 1% | 2% | 1% | 0% | 1% | 2% | 3% | 0% | 2% | 0% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | pm+pt | NA | | pm+pt | NA | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | 5 | 2 | |
| Permitted Phases | 8 | | | 4 | | | 6 | | | 2 | | |
| Actuated Green, G (s) | 31.5 | 31.5 | | 41.5 | 41.5 | | 82.0 | 75.0 | | 82.0 | 75.0 | |
| Effective Green, g (s) | 31.5 | 31.5 | | 41.5 | 41.5 | | 82.0 | 75.0 | | 82.0 | 75.0 | |
| Actuated g/C Ratio | 0.22 | 0.22 | | 0.30 | 0.30 | | 0.59 | 0.54 | | 0.59 | 0.54 | |
| Clearance Time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 3.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 74 | 782 | | 191 | 1004 | | 409 | 1886 | | 216 | 1858 | |
| v/s Ratio Prot | | 0.15 | | 0.03 | c0.23 | | 0.02 | c0.36 | | c0.03 | 0.21 | |
| v/s Ratio Perm | c0.21 | | | 0.16 | | | 0.23 | | | 0.35 | | |
| v/c Ratio | 0.93 | 0.68 | | 0.65 | 0.79 | | 0.43 | 0.67 | | 0.65 | 0.39 | |
| Uniform Delay, d1 | 53.2 | 49.6 | | 39.6 | 45.2 | | 13.9 | 23.6 | | 18.5 | 19.0 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 83.4 | 3.1 | | 7.8 | 4.8 | | 0.7 | 1.9 | | 6.9 | 0.6 | |
| Delay (s) | 136.6 | 52.7 | | 47.4 | 50.0 | | 14.6 | 25.5 | | 25.4 | 19.6 | |
| Level of Service | F | D | | D | D | | B | C | | C | B | |
| Approach Delay (s) | | 62.1 | | | 49.7 | | | 24.1 | | | 20.6 | |
| Approach LOS | | E | | | D | | | C | | | C | |

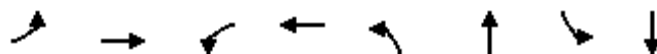
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 35.6 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 0.74 | | |
| Actuated Cycle Length (s) | 140.0 | Sum of lost time (s) | 19.5 |
| Intersection Capacity Utilization | 96.4% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
6: Hansen Road North & Vodden Street East

<Existing>PM
03-11-2020

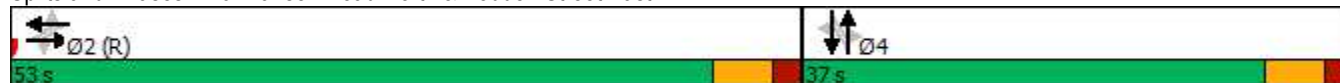


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ |
| Traffic Volume (vph) | 63 | 627 | 109 | 822 | 213 | 172 | 43 | 53 |
| Future Volume (vph) | 63 | 627 | 109 | 822 | 213 | 172 | 43 | 53 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 2 | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 53.0 | 53.0 | 53.0 | 53.0 | 37.0 | 37.0 | 37.0 | 37.0 |
| Total Split (%) | 58.9% | 58.9% | 58.9% | 58.9% | 41.1% | 41.1% | 41.1% | 41.1% |
| 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? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 53.6 | 53.6 | 53.6 | 53.6 | 24.4 | 24.4 | 24.4 | 24.4 |
| Actuated g/C Ratio | 0.60 | 0.60 | 0.60 | 0.60 | 0.27 | 0.27 | 0.27 | 0.27 |
| v/c Ratio | 0.27 | 0.35 | 0.31 | 0.48 | 0.68 | 0.64 | 0.26 | 0.20 |
| Control Delay | 14.7 | 10.6 | 12.3 | 10.5 | 38.9 | 29.6 | 26.9 | 14.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 14.7 | 10.6 | 12.3 | 10.5 | 38.9 | 29.6 | 26.9 | 14.9 |
| LOS | B | B | B | B | D | C | C | B |
| Approach Delay | | 11.0 | | 10.7 | | 33.4 | | 18.8 |
| Approach LOS | | B | | B | | C | | B |

Intersection Summary

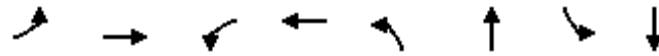
Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 37 (41%), Referenced to phase 2:EBWB, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 16.0
 Intersection Capacity Utilization 83.3%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service E

Splits and Phases: 6: Hansen Road North & Vodden Street East



Queues
6: Hansen Road North & Vodden Street East

<Existing>PM
03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|-------|-------|------|------|------|------|
| Lane Group Flow (vph) | 68 | 752 | 118 | 1011 | 232 | 330 | 47 | 99 |
| v/c Ratio | 0.27 | 0.35 | 0.31 | 0.48 | 0.68 | 0.64 | 0.26 | 0.20 |
| Control Delay | 14.7 | 10.6 | 12.3 | 10.5 | 38.9 | 29.6 | 26.9 | 14.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 14.7 | 10.6 | 12.3 | 10.5 | 38.9 | 29.6 | 26.9 | 14.9 |
| Queue Length 50th (m) | 5.4 | 32.1 | 6.6 | 57.0 | 35.3 | 42.5 | 6.3 | 7.5 |
| Queue Length 95th (m) | 16.1 | 50.9 | m29.7 | m93.4 | 54.6 | 63.1 | 14.1 | 17.3 |
| Internal Link Dist (m) | | 191.2 | | 358.4 | | 69.3 | | 49.9 |
| Turn Bay Length (m) | 28.0 | | 43.0 | | 34.5 | | 24.0 | |
| Base Capacity (vph) | 254 | 2122 | 375 | 2101 | 432 | 640 | 232 | 622 |
| 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 | 0.27 | 0.35 | 0.31 | 0.48 | 0.54 | 0.52 | 0.20 | 0.16 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
6: Hansen Road North & Vodden Street East

<Existing>PM
03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|------|-------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | |
| Traffic Volume (vph) | 63 | 627 | 64 | 109 | 822 | 109 | 213 | 172 | 132 | 43 | 53 | 38 |
| Future Volume (vph) | 63 | 627 | 64 | 109 | 822 | 109 | 213 | 172 | 132 | 43 | 53 | 38 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| 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 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frbp, ped/bikes | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 0.98 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 0.99 | 1.00 | | 0.97 | 1.00 | | 0.99 | 1.00 | |
| Frt | 1.00 | 0.99 | | 1.00 | 0.98 | | 1.00 | 0.94 | | 1.00 | 0.94 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1735 | 3555 | | 1775 | 3515 | | 1720 | 1770 | | 1776 | 1730 | |
| Flt Permitted | 0.23 | 1.00 | | 0.34 | 1.00 | | 0.69 | 1.00 | | 0.36 | 1.00 | |
| Satd. Flow (perm) | 428 | 3555 | | 630 | 3515 | | 1255 | 1770 | | 674 | 1730 | |
| 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 | 682 | 70 | 118 | 893 | 118 | 232 | 187 | 143 | 47 | 58 | 41 |
| RTOR Reduction (vph) | 0 | 7 | 0 | 0 | 10 | 0 | 0 | 34 | 0 | 0 | 30 | 0 |
| Lane Group Flow (vph) | 68 | 745 | 0 | 118 | 1001 | 0 | 232 | 296 | 0 | 47 | 69 | 0 |
| Confl. Peds. (#/hr) | 27 | | 11 | 11 | | 27 | 33 | | 10 | 10 | | 33 |
| Heavy Vehicles (%) | 2% | 1% | 0% | 0% | 1% | 0% | 1% | 1% | 0% | 0% | 4% | 0% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | |
| Actuated Green, G (s) | 53.6 | 53.6 | | 53.6 | 53.6 | | 24.4 | 24.4 | | 24.4 | 24.4 | |
| Effective Green, g (s) | 53.6 | 53.6 | | 53.6 | 53.6 | | 24.4 | 24.4 | | 24.4 | 24.4 | |
| Actuated g/C Ratio | 0.60 | 0.60 | | 0.60 | 0.60 | | 0.27 | 0.27 | | 0.27 | 0.27 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 254 | 2117 | | 375 | 2093 | | 340 | 479 | | 182 | 469 | |
| v/s Ratio Prot | | 0.21 | | | c0.28 | | | 0.17 | | | 0.04 | |
| v/s Ratio Perm | 0.16 | | | 0.19 | | | c0.18 | | | 0.07 | | |
| v/c Ratio | 0.27 | 0.35 | | 0.31 | 0.48 | | 0.68 | 0.62 | | 0.26 | 0.15 | |
| Uniform Delay, d1 | 8.8 | 9.3 | | 9.1 | 10.3 | | 29.3 | 28.7 | | 25.7 | 24.9 | |
| Progression Factor | 1.00 | 1.00 | | 0.87 | 0.86 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 2.6 | 0.5 | | 2.1 | 0.8 | | 7.1 | 3.4 | | 1.6 | 0.3 | |
| Delay (s) | 11.3 | 9.8 | | 10.0 | 9.6 | | 36.4 | 32.1 | | 27.3 | 25.2 | |
| Level of Service | B | A | | A | A | | D | C | | C | C | |
| Approach Delay (s) | | 9.9 | | | 9.7 | | | 33.9 | | | 25.9 | |
| Approach LOS | | A | | | A | | | C | | | C | |

| Intersection Summary | | |
|-----------------------------------|-------|---------------------------|
| HCM 2000 Control Delay | 15.8 | HCM 2000 Level of Service |
| HCM 2000 Volume to Capacity ratio | 0.54 | B |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) |
| Intersection Capacity Utilization | 83.3% | 12.0 |
| Analysis Period (min) | 15 | ICU Level of Service |
| | | E |

c Critical Lane Group

Timings
8: Archdekin Drive & Vodden Street East

<Existing>PM
03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↕↕ | | ↕↕ | | ↕↕ | | ↕↕ |
| Traffic Volume (vph) | 21 | 308 | 16 | 548 | 1 | 2 | 4 | 2 |
| Future Volume (vph) | 21 | 308 | 16 | 548 | 1 | 2 | 4 | 2 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 2 | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 23.0 | 23.0 | 23.0 | 23.0 | 31.0 | 31.0 | 31.0 | 31.0 |
| Total Split (s) | 58.0 | 58.0 | 58.0 | 58.0 | 32.0 | 32.0 | 32.0 | 32.0 |
| Total Split (%) | 64.4% | 64.4% | 64.4% | 64.4% | 35.6% | 35.6% | 35.6% | 35.6% |
| 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | | 81.7 | | 81.7 | | 8.3 | | 8.3 |
| Actuated g/C Ratio | | 0.91 | | 0.91 | | 0.09 | | 0.09 |
| v/c Ratio | | 0.13 | | 0.21 | | 0.06 | | 0.05 |
| Control Delay | | 1.6 | | 1.7 | | 28.0 | | 34.0 |
| Queue Delay | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Total Delay | | 1.6 | | 1.7 | | 28.0 | | 34.0 |
| LOS | | A | | A | | C | | C |
| Approach Delay | | 1.6 | | 1.7 | | 28.0 | | 34.0 |
| Approach LOS | | A | | A | | C | | C |

Intersection Summary

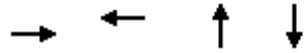
| | |
|--|------------------------|
| Cycle Length: 90 | |
| Actuated Cycle Length: 90 | |
| Offset: 33 (37%), Referenced to phase 2:EBWB, Start of Green | |
| Natural Cycle: 55 | |
| Control Type: Actuated-Coordinated | |
| Maximum v/c Ratio: 0.21 | |
| Intersection Signal Delay: 2.1 | Intersection LOS: A |
| Intersection Capacity Utilization 45.9% | ICU Level of Service A |
| Analysis Period (min) 15 | |

Splits and Phases: 8: Archdekin Drive & Vodden Street East



Queues
8: Archdekin Drive & Vodden Street East

<Existing>PM
03-11-2020



| Lane Group | EBT | WBT | NBT | SBT |
|------------------------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 372 | 637 | 8 | 8 |
| v/c Ratio | 0.13 | 0.21 | 0.06 | 0.05 |
| Control Delay | 1.6 | 1.7 | 28.0 | 34.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 1.6 | 1.7 | 28.0 | 34.0 |
| Queue Length 50th (m) | 0.0 | 0.0 | 0.5 | 1.0 |
| Queue Length 95th (m) | m10.0 | 17.6 | 4.5 | 5.0 |
| Internal Link Dist (m) | 418.5 | 579.8 | 115.4 | 151.2 |
| Turn Bay Length (m) | | | | |
| Base Capacity (vph) | 2917 | 3027 | 430 | 459 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.13 | 0.21 | 0.02 | 0.02 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
8: Archdekin Drive & Vodden Street East

<Existing>PM
03-11-2020



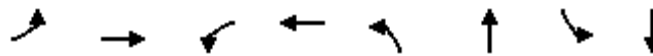
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | |
|-----------------------------------|------|------|-------|------|------|------|------|------|------|------|------|---------------------------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | | ↕ | | | ↕ | | |
| Traffic Volume (vph) | 21 | 308 | 13 | 16 | 548 | 22 | 1 | 2 | 5 | 4 | 2 | 2 | |
| Future Volume (vph) | 21 | 308 | 13 | 16 | 548 | 22 | 1 | 2 | 5 | 4 | 2 | 2 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Total Lost time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 1.00 | | | 1.00 | | |
| Frbp, ped/bikes | | 1.00 | | | 1.00 | | | 0.99 | | | 1.00 | | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 1.00 | | |
| Frt | | 0.99 | | | 0.99 | | | 0.92 | | | 0.97 | | |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.99 | | | 0.98 | | |
| Satd. Flow (prot) | | 3550 | | | 3537 | | | 1538 | | | 1807 | | |
| Flt Permitted | | 0.90 | | | 0.94 | | | 0.95 | | | 0.86 | | |
| Satd. Flow (perm) | | 3211 | | | 3334 | | | 1476 | | | 1588 | | |
| 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) | 23 | 335 | 14 | 17 | 596 | 24 | 1 | 2 | 5 | 4 | 2 | 2 | |
| RTOR Reduction (vph) | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 0 | 2 | 0 | |
| Lane Group Flow (vph) | 0 | 371 | 0 | 0 | 636 | 0 | 0 | 3 | 0 | 0 | 6 | 0 | |
| Confl. Peds. (#/hr) | | | | | | | | | 4 | 4 | | | |
| Heavy Vehicles (%) | 0% | 1% | 16% | 7% | 2% | 0% | 0% | 0% | 20% | 0% | 0% | 0% | |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | | |
| Actuated Green, G (s) | | 74.5 | | | 74.5 | | | 3.5 | | | 3.5 | | |
| Effective Green, g (s) | | 74.5 | | | 74.5 | | | 3.5 | | | 3.5 | | |
| Actuated g/C Ratio | | 0.83 | | | 0.83 | | | 0.04 | | | 0.04 | | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | | |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | | |
| Lane Grp Cap (vph) | | 2657 | | | 2759 | | | 57 | | | 61 | | |
| v/s Ratio Prot | | | | | | | | | | | | | |
| v/s Ratio Perm | | 0.12 | | | 0.19 | | | 0.00 | | | 0.00 | | |
| v/c Ratio | | 0.14 | | | 0.23 | | | 0.06 | | | 0.10 | | |
| Uniform Delay, d1 | | 1.5 | | | 1.6 | | | 41.7 | | | 41.7 | | |
| Progression Factor | | 1.07 | | | 1.00 | | | 1.00 | | | 1.00 | | |
| Incremental Delay, d2 | | 0.1 | | | 0.2 | | | 0.9 | | | 1.5 | | |
| Delay (s) | | 1.7 | | | 1.8 | | | 42.5 | | | 43.2 | | |
| Level of Service | | A | | | A | | | D | | | D | | |
| Approach Delay (s) | | 1.7 | | | 1.8 | | | 42.5 | | | 43.2 | | |
| Approach LOS | | A | | | A | | | D | | | D | | |
| Intersection Summary | | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 2.4 | | | | | | | | | HCM 2000 Level of Service | A |
| HCM 2000 Volume to Capacity ratio | | | 0.22 | | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | | | | | | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | | | 45.9% | | | | | | | | | ICU Level of Service | A |
| Analysis Period (min) | | | 15 | | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | | |

Timings

<Existing>PM

9: Laurelcrest Street/Leeward Drive & Vodden Street East

03-11-2020



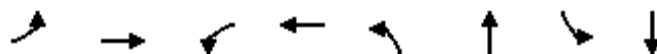
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↘ | ↕ | ↙ | ↕ | ↙ | ↕ | ↙ | ↕ |
| Traffic Volume (vph) | 5 | 442 | 87 | 609 | 317 | 13 | 4 | 5 |
| Future Volume (vph) | 5 | 442 | 87 | 609 | 317 | 13 | 4 | 5 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 4 | | 8 | | 6 | | 2 |
| Permitted Phases | 4 | | 8 | | 6 | | 2 | |
| Detector Phase | 4 | 4 | 8 | 8 | 6 | 6 | 2 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 31.0 | 31.0 | 31.0 | 31.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 32.0 | 32.0 | 32.0 | 32.0 | 68.0 | 68.0 | 68.0 | 68.0 |
| Total Split (%) | 32.0% | 32.0% | 32.0% | 32.0% | 68.0% | 68.0% | 68.0% | 68.0% |
| 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? | | | | | | | | |
| Recall Mode | None | None | Max | Max | C-Max | C-Max | C-Max | C-Max |
| Act Effct Green (s) | 26.0 | 26.0 | 26.0 | 26.0 | 62.0 | 62.0 | 62.0 | 62.0 |
| Actuated g/C Ratio | 0.26 | 0.26 | 0.26 | 0.26 | 0.62 | 0.62 | 0.62 | 0.62 |
| v/c Ratio | 0.05 | 0.64 | 0.75 | 0.72 | 0.40 | 0.23 | 0.01 | 0.01 |
| Control Delay | 29.6 | 34.9 | 69.9 | 38.7 | 11.3 | 5.7 | 7.2 | 5.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 29.6 | 34.9 | 69.9 | 38.7 | 11.3 | 5.7 | 7.2 | 5.6 |
| LOS | C | C | E | D | B | A | A | A |
| Approach Delay | | 34.9 | | 42.6 | | 9.0 | | 6.0 |
| Approach LOS | | C | | D | | A | | A |

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 84 (84%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.75
 Intersection Signal Delay: 30.0
 Intersection LOS: C
 Intersection Capacity Utilization 66.7%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 9: Laurelcrest Street/Leeward Drive & Vodden Street East





| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|-------|-------|------|------|------|-------|
| Lane Group Flow (vph) | 5 | 597 | 95 | 676 | 345 | 240 | 4 | 10 |
| v/c Ratio | 0.05 | 0.64 | 0.75 | 0.72 | 0.40 | 0.23 | 0.01 | 0.01 |
| Control Delay | 29.6 | 34.9 | 69.9 | 38.7 | 11.3 | 5.7 | 7.2 | 5.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 29.6 | 34.9 | 69.9 | 38.7 | 11.3 | 5.7 | 7.2 | 5.6 |
| Queue Length 50th (m) | 0.7 | 51.5 | 16.9 | 62.6 | 31.0 | 11.3 | 0.3 | 0.3 |
| Queue Length 95th (m) | 3.7 | 69.6 | #43.8 | 82.5 | 48.7 | 21.5 | 1.5 | 2.2 |
| Internal Link Dist (m) | | 266.2 | | 256.7 | | 92.3 | | 301.6 |
| Turn Bay Length (m) | 36.0 | | 42.5 | | 43.0 | | 22.0 | |
| Base Capacity (vph) | 101 | 930 | 127 | 938 | 866 | 1032 | 708 | 1103 |
| 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 | 0.05 | 0.64 | 0.75 | 0.72 | 0.40 | 0.23 | 0.01 | 0.01 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 9: Laurelcrest Street/Leeward Drive & Vodden Street East

<Existing>PM
 03-11-2020



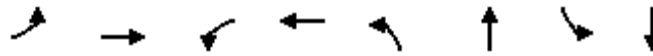
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 5 | 442 | 108 | 87 | 609 | 13 | 317 | 13 | 208 | 4 | 5 | 5 |
| Future Volume (vph) | 5 | 442 | 108 | 87 | 609 | 13 | 317 | 13 | 208 | 4 | 5 | 5 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| 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 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.97 | | 1.00 | 1.00 | | 1.00 | 0.86 | | 1.00 | 0.93 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1784 | 3494 | | 1744 | 3602 | | 1767 | 1609 | | 1779 | 1777 | |
| Flt Permitted | 0.21 | 1.00 | | 0.27 | 1.00 | | 0.75 | 1.00 | | 0.61 | 1.00 | |
| Satd. Flow (perm) | 392 | 3494 | | 492 | 3602 | | 1397 | 1609 | | 1142 | 1777 | |
| 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) | 5 | 480 | 117 | 95 | 662 | 14 | 345 | 14 | 226 | 4 | 5 | 5 |
| RTOR Reduction (vph) | 0 | 21 | 0 | 0 | 1 | 0 | 0 | 34 | 0 | 0 | 2 | 0 |
| Lane Group Flow (vph) | 5 | 576 | 0 | 95 | 675 | 0 | 345 | 206 | 0 | 4 | 8 | 0 |
| Confl. Peds. (#/hr) | 1 | | 5 | 5 | | 1 | | | 3 | 3 | | |
| Heavy Vehicles (%) | 0% | 1% | 0% | 2% | 1% | 0% | 1% | 0% | 1% | 0% | 0% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 6 | | | 2 | |
| Permitted Phases | 4 | | | 8 | | | 6 | | | 2 | | |
| Actuated Green, G (s) | 26.0 | 26.0 | | 26.0 | 26.0 | | 62.0 | 62.0 | | 62.0 | 62.0 | |
| Effective Green, g (s) | 26.0 | 26.0 | | 26.0 | 26.0 | | 62.0 | 62.0 | | 62.0 | 62.0 | |
| Actuated g/C Ratio | 0.26 | 0.26 | | 0.26 | 0.26 | | 0.62 | 0.62 | | 0.62 | 0.62 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 101 | 908 | | 127 | 936 | | 866 | 997 | | 708 | 1101 | |
| v/s Ratio Prot | | 0.16 | | | 0.19 | | | 0.13 | | | 0.00 | |
| v/s Ratio Perm | 0.01 | | | 0.19 | | | 0.25 | | | 0.00 | | |
| v/c Ratio | 0.05 | 0.63 | | 0.75 | 0.72 | | 0.40 | 0.21 | | 0.01 | 0.01 | |
| Uniform Delay, d1 | 27.7 | 32.8 | | 34.0 | 33.7 | | 9.6 | 8.3 | | 7.2 | 7.3 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.4 | 2.0 | | 32.7 | 4.8 | | 1.4 | 0.5 | | 0.0 | 0.0 | |
| Delay (s) | 28.2 | 34.8 | | 66.7 | 38.5 | | 11.0 | 8.8 | | 7.3 | 7.3 | |
| Level of Service | C | C | | E | D | | B | A | | A | A | |
| Approach Delay (s) | | 34.7 | | | 41.9 | | | 10.1 | | | 7.3 | |
| Approach LOS | | C | | | D | | | B | | | A | |

| Intersection Summary | | |
|-----------------------------------|-------|---------------------------|
| HCM 2000 Control Delay | 30.0 | HCM 2000 Level of Service |
| HCM 2000 Volume to Capacity ratio | 0.50 | C |
| Actuated Cycle Length (s) | 100.0 | Sum of lost time (s) |
| Intersection Capacity Utilization | 66.7% | 12.0 |
| Analysis Period (min) | 15 | ICU Level of Service |
| | | C |

c Critical Lane Group

Timings
10: Vodden Street East & Howden Blvd

<Existing>PM
03-11-2020

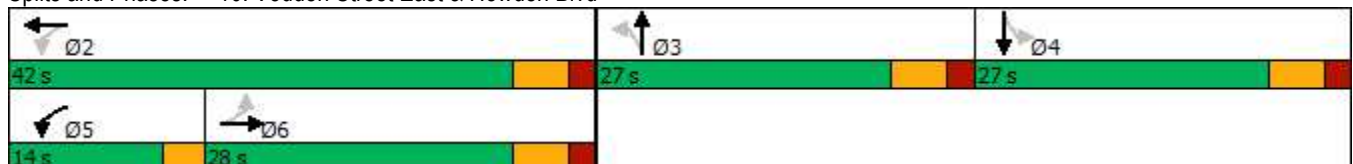


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|--------|-------|-------|-------|
| Lane Configurations | ↙ | ↕ | ↙ | ↕ | ↙ | ↕ | ↙ | ↕ |
| Traffic Volume (vph) | 8 | 176 | 472 | 306 | 441 | 9 | 2 | 3 |
| Future Volume (vph) | 8 | 176 | 472 | 306 | 441 | 9 | 2 | 3 |
| Turn Type | Perm | NA | pm+pt | NA | Perm | NA | Perm | NA |
| Protected Phases | | 6 | 5 | 2 | | 3 | | 4 |
| Permitted Phases | 6 | | 2 | | 3 | | 4 | |
| Detector Phase | 6 | 6 | 5 | 2 | 3 | 3 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 24.0 | 24.0 | 9.0 | 24.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 28.0 | 28.0 | 14.0 | 42.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (%) | 29.2% | 29.2% | 14.6% | 43.8% | 28.1% | 28.1% | 28.1% | 28.1% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 0.0 | 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 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lag | Lag | Lead | | Lead | Lead | Lag | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | | Yes | Yes | Yes | Yes |
| Recall Mode | Max | Max | None | Max | None | None | None | None |
| Act Effct Green (s) | 22.1 | 22.1 | 39.2 | 36.2 | 21.1 | 21.1 | 8.1 | 8.1 |
| Actuated g/C Ratio | 0.31 | 0.31 | 0.55 | 0.50 | 0.29 | 0.29 | 0.11 | 0.11 |
| v/c Ratio | 0.02 | 0.40 | 0.88 | 0.17 | 4.24 | 0.42 | 0.01 | 0.02 |
| Control Delay | 20.2 | 8.7 | 33.6 | 10.8 | 1489.0 | 5.9 | 31.5 | 28.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 20.2 | 8.7 | 33.6 | 10.8 | 1489.0 | 5.9 | 31.5 | 28.8 |
| LOS | C | A | C | B | F | A | C | C |
| Approach Delay | | 8.9 | | 24.6 | | 921.9 | | 29.7 |
| Approach LOS | | A | | C | | F | | C |

Intersection Summary

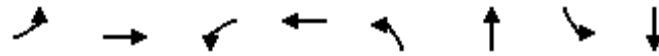
| | |
|---|------------------------|
| Cycle Length: 96 | |
| Actuated Cycle Length: 71.9 | |
| Natural Cycle: 90 | |
| Control Type: Semi Act-Uncoord | |
| Maximum v/c Ratio: 4.24 | |
| Intersection Signal Delay: 342.9 | Intersection LOS: F |
| Intersection Capacity Utilization 85.6% | ICU Level of Service E |
| Analysis Period (min) 15 | |

Splits and Phases: 10: Vodden Street East & Howden Blvd



Queues
10: Vodden Street East & Howden Blvd

<Existing>PM
03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|--------|-------|--------|-------|------|------|
| Lane Group Flow (vph) | 8 | 483 | 472 | 306 | 441 | 273 | 2 | 4 |
| v/c Ratio | 0.02 | 0.40 | 0.88 | 0.17 | 4.24 | 0.42 | 0.01 | 0.02 |
| Control Delay | 20.2 | 8.7 | 33.6 | 10.8 | 1489.0 | 5.9 | 31.5 | 28.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 20.2 | 8.7 | 33.6 | 10.8 | 1489.0 | 5.9 | 31.5 | 28.8 |
| Queue Length 50th (m) | 0.7 | 8.5 | 32.8 | 10.0 | ~96.2 | 0.8 | 0.3 | 0.4 |
| Queue Length 95th (m) | 4.2 | 23.8 | #122.6 | 23.4 | #178.0 | 18.7 | 2.2 | 3.3 |
| Internal Link Dist (m) | | 397.6 | | 661.5 | | 256.7 | | 23.3 |
| Turn Bay Length (m) | 6.0 | | 25.5 | | | | | |
| Base Capacity (vph) | 322 | 1199 | 536 | 1791 | 104 | 657 | 550 | 541 |
| 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 | 0.02 | 0.40 | 0.88 | 0.17 | 4.24 | 0.42 | 0.00 | 0.01 |

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
10: Vodden Street East & Howden Blvd

<Existing>PM
03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---------------------------|------|------|------|-------|------|------|--------|--------|------|------|-------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 8 | 176 | 307 | 472 | 306 | 0 | 441 | 9 | 264 | 2 | 3 | 1 |
| Future Volume (vph) | 8 | 176 | 307 | 472 | 306 | 0 | 441 | 9 | 264 | 2 | 3 | 1 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Fr _t | 1.00 | 0.90 | | 1.00 | 1.00 | | 1.00 | 0.85 | | 1.00 | 0.96 | |
| Fl _t Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1770 | 3205 | | 1767 | 3557 | | 1785 | 1603 | | 1781 | 1841 | |
| Fl _t Permitted | 0.57 | 1.00 | | 0.36 | 1.00 | | 0.19 | 1.00 | | 1.00 | 1.00 | |
| Satd. Flow (perm) | 1054 | 3205 | | 675 | 3557 | | 356 | 1603 | | 1875 | 1841 | |
| Peak-hour factor, PHF | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 8 | 176 | 307 | 472 | 306 | 0 | 441 | 9 | 264 | 2 | 3 | 1 |
| RTOR Reduction (vph) | 0 | 219 | 0 | 0 | 0 | 0 | 0 | 191 | 0 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 8 | 264 | 0 | 472 | 306 | 0 | 441 | 82 | 0 | 2 | 3 | 0 |
| Confl. Peds. (#/hr) | 6 | | 2 | 2 | | 6 | 5 | | 3 | 3 | | 5 |
| Heavy Vehicles (%) | 0% | 4% | 0% | 1% | 2% | 2% | 0% | 0% | 1% | 0% | 0% | 0% |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 6 | | 5 | 2 | | | 3 | | | 4 | |
| Permitted Phases | 6 | | | 2 | | | 3 | | | 4 | | |
| Actuated Green, G (s) | 22.1 | 22.1 | | 36.2 | 36.2 | | 21.1 | 21.1 | | 1.4 | 1.4 | |
| Effective Green, g (s) | 22.1 | 22.1 | | 36.2 | 36.2 | | 21.1 | 21.1 | | 1.4 | 1.4 | |
| Actuated g/C Ratio | 0.29 | 0.29 | | 0.47 | 0.47 | | 0.28 | 0.28 | | 0.02 | 0.02 | |
| Clearance Time (s) | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 303 | 923 | | 476 | 1678 | | 97 | 440 | | 34 | 33 | |
| v/s Ratio Prot | | 0.08 | | c0.14 | 0.09 | | | 0.05 | | | c0.00 | |
| v/s Ratio Perm | 0.01 | | | c0.32 | | | c1.24 | | | 0.00 | | |
| v/c Ratio | 0.03 | 0.29 | | 0.99 | 0.18 | | 4.55 | 0.19 | | 0.06 | 0.09 | |
| Uniform Delay, d1 | 19.6 | 21.2 | | 17.3 | 11.7 | | 27.8 | 21.2 | | 37.0 | 37.0 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.2 | 0.8 | | 38.9 | 0.2 | | 1619.3 | 0.4 | | 1.5 | 2.5 | |
| Delay (s) | 19.7 | 22.0 | | 56.2 | 11.9 | | 1647.1 | 21.7 | | 38.5 | 39.5 | |
| Level of Service | B | C | | E | B | | F | C | | D | D | |
| Approach Delay (s) | | 21.9 | | | 38.8 | | | 1025.6 | | | 39.2 | |
| Approach LOS | | C | | | D | | | F | | | D | |

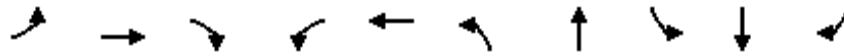
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 388.9 | HCM 2000 Level of Service | F |
| HCM 2000 Volume to Capacity ratio | 2.35 | | |
| Actuated Cycle Length (s) | 76.7 | Sum of lost time (s) | 21.0 |
| Intersection Capacity Utilization | 85.6% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
11: Howden Blvd/N Park Drive & Willams Parkway

<Existing>PM
03-11-2020

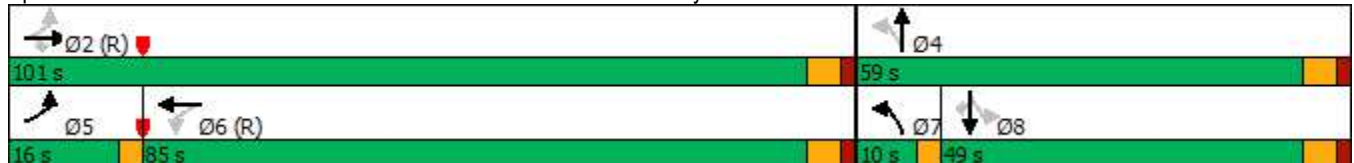


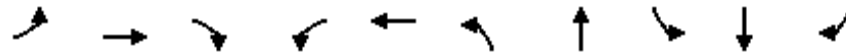
| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↗ | ↗↗ | ↗ | ↗ | ↗↗ | ↗ | ↗↗ | ↗ | ↗↗ | ↗ |
| Traffic Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 228 | 430 | 28 | 335 | 381 |
| Future Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 228 | 430 | 28 | 335 | 381 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | pm+pt | NA | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | 7 | 4 | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 4 | | 8 | | 8 |
| Detector Phase | 5 | 2 | 2 | 6 | 6 | 7 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 9.0 | 43.0 | 43.0 | 43.0 | 43.0 | 9.0 | 48.0 | 48.0 | 48.0 | 48.0 |
| Total Split (s) | 16.0 | 101.0 | 101.0 | 85.0 | 85.0 | 10.0 | 59.0 | 49.0 | 49.0 | 49.0 |
| Total Split (%) | 10.0% | 63.1% | 63.1% | 53.1% | 53.1% | 6.3% | 36.9% | 30.6% | 30.6% | 30.6% |
| Yellow Time (s) | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 0.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 0.0 | 0.0 |
| Total Lost Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lead | | | Lag | Lag | Lead | | Lag | Lag | Lag |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | Yes | | Yes | Yes | Yes |
| Recall Mode | None | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 105.9 | 102.9 | 102.9 | 86.9 | 86.9 | 48.1 | 45.1 | 35.1 | 35.1 | 35.1 |
| Actuated g/C Ratio | 0.66 | 0.64 | 0.64 | 0.54 | 0.54 | 0.30 | 0.28 | 0.22 | 0.22 | 0.22 |
| v/c Ratio | 0.87 | 0.34 | 0.21 | 0.30 | 0.70 | 0.97 | 0.58 | 0.22 | 0.46 | 0.87 |
| Control Delay | 55.5 | 14.5 | 7.2 | 25.1 | 30.7 | 100.1 | 49.2 | 51.6 | 55.2 | 53.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 55.5 | 14.5 | 7.2 | 25.1 | 30.7 | 100.1 | 49.2 | 51.6 | 55.2 | 53.0 |
| LOS | E | B | A | C | C | F | D | D | E | D |
| Approach Delay | | 20.4 | | | 30.3 | | 64.4 | | 53.9 | |
| Approach LOS | | C | | | C | | E | | D | |

Intersection Summary

Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 7 (4%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 38.4
 Intersection LOS: D
 Intersection Capacity Utilization 87.0%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 11: Howden Blvd/N Park Drive & Willams Parkway





| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|------------------------|-------|-------|------|------|-------|--------|-------|------|-------|-------|
| Lane Group Flow (vph) | 216 | 786 | 226 | 110 | 1371 | 248 | 583 | 30 | 364 | 414 |
| v/c Ratio | 0.87 | 0.34 | 0.21 | 0.30 | 0.70 | 0.97 | 0.58 | 0.22 | 0.46 | 0.87 |
| Control Delay | 55.5 | 14.5 | 7.2 | 25.1 | 30.7 | 100.1 | 49.2 | 51.6 | 55.2 | 53.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 55.5 | 14.5 | 7.2 | 25.1 | 30.7 | 100.1 | 49.2 | 51.6 | 55.2 | 53.0 |
| Queue Length 50th (m) | 34.0 | 59.6 | 14.1 | 19.3 | 169.8 | 63.1 | 80.0 | 7.8 | 52.5 | 77.6 |
| Queue Length 95th (m) | #85.8 | 79.6 | 29.0 | 37.0 | 212.5 | #102.5 | 94.1 | 17.3 | 65.4 | 116.8 |
| Internal Link Dist (m) | | 268.4 | | | 661.6 | | 117.9 | | 218.4 | |
| Turn Bay Length (m) | 162.0 | | 20.0 | 44.0 | | 52.5 | | 44.0 | | 21.5 |
| Base Capacity (vph) | 248 | 2283 | 1066 | 361 | 1957 | 255 | 1174 | 170 | 961 | 542 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.87 | 0.34 | 0.21 | 0.30 | 0.70 | 0.97 | 0.50 | 0.18 | 0.38 | 0.76 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 11: Howden Blvd/N Park Drive & Willams Parkway

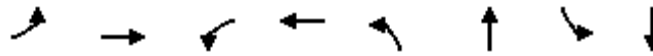
<Existing>PM
 03-11-2020

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|-------|-------|-------|------|------|------|---------------------------|------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 27 | 228 | 430 | 107 | 28 | 335 | 381 |
| Future Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 27 | 228 | 430 | 107 | 28 | 335 | 381 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Lane Util. Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 0.98 |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Fr _t | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| Fl _t Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1767 | 3550 | 1597 | 1785 | 3602 | | 1784 | 3506 | | 1785 | 3579 | 1542 |
| Fl _t Permitted | 0.10 | 1.00 | 1.00 | 0.35 | 1.00 | | 0.37 | 1.00 | | 0.34 | 1.00 | 1.00 |
| Satd. Flow (perm) | 180 | 3550 | 1597 | 666 | 3602 | | 691 | 3506 | | 636 | 3579 | 1542 |
| 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) | 216 | 786 | 226 | 110 | 1342 | 29 | 248 | 467 | 116 | 30 | 364 | 414 |
| RTOR Reduction (vph) | 0 | 0 | 39 | 0 | 1 | 0 | 0 | 14 | 0 | 0 | 0 | 137 |
| Lane Group Flow (vph) | 216 | 786 | 187 | 110 | 1370 | 0 | 248 | 569 | 0 | 30 | 364 | 277 |
| Confl. Peds. (#/hr) | 4 | | | | | 4 | 3 | | | | | 3 |
| Heavy Vehicles (%) | 1% | 2% | 0% | 0% | 1% | 0% | 0% | 1% | 1% | 0% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | | pm+pt | NA | | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | | 7 | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 102.9 | 102.9 | 102.9 | 86.9 | 86.9 | | 45.1 | 45.1 | | 35.1 | 35.1 | 35.1 |
| Effective Green, g (s) | 102.9 | 102.9 | 102.9 | 86.9 | 86.9 | | 45.1 | 45.1 | | 35.1 | 35.1 | 35.1 |
| Actuated g/C Ratio | 0.64 | 0.64 | 0.64 | 0.54 | 0.54 | | 0.28 | 0.28 | | 0.22 | 0.22 | 0.22 |
| Clearance Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 244 | 2283 | 1027 | 361 | 1956 | | 242 | 988 | | 139 | 785 | 338 |
| v/s Ratio Prot | c0.07 | 0.22 | | | 0.38 | | c0.04 | 0.16 | | | 0.10 | |
| v/s Ratio Perm | c0.50 | | 0.12 | 0.17 | | | c0.24 | | | 0.05 | | 0.18 |
| v/c Ratio | 0.89 | 0.34 | 0.18 | 0.30 | 0.70 | | 1.02 | 0.58 | | 0.22 | 0.46 | 0.82 |
| Uniform Delay, d1 | 32.8 | 13.1 | 11.5 | 20.0 | 27.0 | | 57.7 | 49.2 | | 51.2 | 54.3 | 59.5 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 29.3 | 0.4 | 0.4 | 2.2 | 2.1 | | 64.4 | 1.3 | | 1.6 | 0.9 | 16.3 |
| Delay (s) | 62.1 | 13.5 | 11.9 | 22.2 | 29.1 | | 122.1 | 50.5 | | 52.8 | 55.2 | 75.8 |
| Level of Service | E | B | B | C | C | | F | D | | D | E | E |
| Approach Delay (s) | | 21.8 | | | 28.6 | | | 71.9 | | | 65.6 | |
| Approach LOS | | C | | | C | | | E | | | E | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 41.8 | | | | HCM 2000 Level of Service | | | D | | |
| HCM 2000 Volume to Capacity ratio | | | 0.96 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 160.0 | | | | Sum of lost time (s) | | | 18.0 | | |
| Intersection Capacity Utilization | | | 87.0% | | | | ICU Level of Service | | | E | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
12: Dixie Road & Howden Blvd

<Existing>PM
03-11-2020

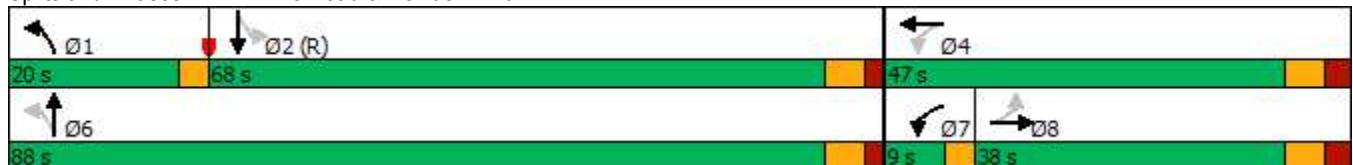


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ |
| Traffic Volume (vph) | 38 | 230 | 79 | 474 | 342 | 1630 | 48 | 578 |
| Future Volume (vph) | 38 | 230 | 79 | 474 | 342 | 1630 | 48 | 578 |
| Turn Type | Perm | NA | pm+pt | NA | pm+pt | NA | Perm | NA |
| Protected Phases | | 8 | 7 | 4 | 1 | 6 | | 2 |
| Permitted Phases | 8 | | 4 | | 6 | | 2 | |
| Detector Phase | 8 | 8 | 7 | 4 | 1 | 6 | 2 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.8 | 36.8 | 8.0 | 36.8 | 8.0 | 40.1 | 40.1 | 40.1 |
| Total Split (s) | 38.0 | 38.0 | 9.0 | 47.0 | 20.0 | 88.0 | 68.0 | 68.0 |
| Total Split (%) | 28.1% | 28.1% | 6.7% | 34.8% | 14.8% | 65.2% | 50.4% | 50.4% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 0.0 | 2.8 | 0.0 | 2.1 | 2.1 | 2.1 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 3.0 | 6.8 | 3.0 | 6.1 | 6.1 | 6.1 |
| Lead/Lag | Lag | Lag | Lead | | Lead | | Lag | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | | Yes | | Yes | Yes |
| Recall Mode | None | None | None | None | None | Max | C-Max | C-Max |
| Act Effct Green (s) | 21.0 | 21.0 | 33.8 | 30.0 | 95.2 | 92.1 | 74.6 | 74.6 |
| Actuated g/C Ratio | 0.16 | 0.16 | 0.25 | 0.22 | 0.71 | 0.68 | 0.55 | 0.55 |
| v/c Ratio | 0.41 | 0.65 | 0.45 | 0.73 | 0.60 | 0.75 | 0.56 | 0.33 |
| Control Delay | 62.8 | 41.3 | 46.6 | 52.9 | 12.7 | 17.5 | 52.0 | 18.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 62.8 | 41.3 | 46.6 | 52.9 | 12.7 | 17.5 | 52.0 | 18.1 |
| LOS | E | D | D | D | B | B | D | B |
| Approach Delay | | 43.2 | | 52.1 | | 16.7 | | 20.6 |
| Approach LOS | | D | | D | | B | | C |

Intersection Summary

Cycle Length: 135
 Actuated Cycle Length: 135
 Offset: 32 (24%), Referenced to phase 2:SBTL, Start of Green
 Natural Cycle: 105
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.75
 Intersection Signal Delay: 26.3
 Intersection LOS: C
 Intersection Capacity Utilization 102.3%
 ICU Level of Service G
 Analysis Period (min) 15

Splits and Phases: 12: Dixie Road & Howden Blvd

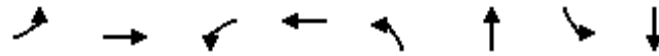


Queues

12: Dixie Road & Howden Blvd

<Existing>PM

03-11-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|------|-------|------|-------|-------|-------|
| Lane Group Flow (vph) | 39 | 402 | 81 | 572 | 349 | 1792 | 49 | 626 |
| v/c Ratio | 0.41 | 0.65 | 0.45 | 0.73 | 0.60 | 0.75 | 0.56 | 0.33 |
| Control Delay | 62.8 | 41.3 | 46.6 | 52.9 | 12.7 | 17.5 | 52.0 | 18.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 62.8 | 41.3 | 46.6 | 52.9 | 12.7 | 17.5 | 52.0 | 18.1 |
| Queue Length 50th (m) | 9.5 | 37.3 | 17.1 | 73.3 | 30.9 | 149.8 | 8.2 | 46.3 |
| Queue Length 95th (m) | 20.5 | 51.1 | 28.6 | 87.1 | 53.4 | 212.5 | #32.4 | 68.2 |
| Internal Link Dist (m) | | 661.5 | | 187.9 | | 169.3 | | 320.7 |
| Turn Bay Length (m) | 53.0 | | 66.0 | | 71.5 | | 40.0 | |
| Base Capacity (vph) | 141 | 854 | 180 | 1041 | 601 | 2376 | 88 | 1891 |
| 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 | 0.28 | 0.47 | 0.45 | 0.55 | 0.58 | 0.75 | 0.56 | 0.33 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
12: Dixie Road & Howden Blvd

<Existing>PM
03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|-------|-------|------|-------|-------|------|------|------|------|
| Lane Configurations | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | |
| Traffic Volume (vph) | 38 | 230 | 164 | 79 | 474 | 86 | 342 | 1630 | 126 | 48 | 578 | 35 |
| Future Volume (vph) | 38 | 230 | 164 | 79 | 474 | 86 | 342 | 1630 | 126 | 48 | 578 | 35 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.1 | | 6.1 | 6.1 | |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.94 | | 1.00 | 0.98 | | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1776 | 3287 | | 1748 | 3459 | | 1747 | 3478 | | 1732 | 3419 | |
| Flt Permitted | 0.33 | 1.00 | | 0.27 | 1.00 | | 0.36 | 1.00 | | 0.09 | 1.00 | |
| Satd. Flow (perm) | 611 | 3287 | | 499 | 3459 | | 660 | 3478 | | 160 | 3419 | |
| Peak-hour factor, PHF | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Adj. Flow (vph) | 39 | 235 | 167 | 81 | 484 | 88 | 349 | 1663 | 129 | 49 | 590 | 36 |
| RTOR Reduction (vph) | 0 | 104 | 0 | 0 | 12 | 0 | 0 | 3 | 0 | 0 | 3 | 0 |
| Lane Group Flow (vph) | 39 | 298 | 0 | 81 | 560 | 0 | 349 | 1789 | 0 | 49 | 623 | 0 |
| Confl. Peds. (#/hr) | 9 | | 7 | 7 | | 9 | 11 | | 7 | 7 | | 11 |
| Heavy Vehicles (%) | 0% | 3% | 1% | 2% | 2% | 0% | 2% | 2% | 2% | 3% | 4% | 0% |
| Bus Blockages (#/hr) | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 8 | 0 | 0 | 9 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | pm+pt | NA | | Perm | NA | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | | 2 | |
| Permitted Phases | 8 | | | 4 | | | 6 | | | 2 | | |
| Actuated Green, G (s) | 21.0 | 21.0 | | 30.0 | 30.0 | | 92.1 | 92.1 | | 74.6 | 74.6 | |
| Effective Green, g (s) | 21.0 | 21.0 | | 30.0 | 30.0 | | 92.1 | 92.1 | | 74.6 | 74.6 | |
| Actuated g/C Ratio | 0.16 | 0.16 | | 0.22 | 0.22 | | 0.68 | 0.68 | | 0.55 | 0.55 | |
| Clearance Time (s) | 6.8 | 6.8 | | 3.0 | 6.8 | | 3.0 | 6.1 | | 6.1 | 6.1 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 95 | 511 | | 166 | 768 | | 567 | 2372 | | 88 | 1889 | |
| v/s Ratio Prot | | 0.09 | | 0.02 | c0.16 | | 0.07 | c0.51 | | | 0.18 | |
| v/s Ratio Perm | 0.06 | | | 0.09 | | | 0.35 | | | 0.31 | | |
| v/c Ratio | 0.41 | 0.58 | | 0.49 | 0.73 | | 0.62 | 0.75 | | 0.56 | 0.33 | |
| Uniform Delay, d1 | 51.4 | 52.9 | | 43.3 | 48.7 | | 9.3 | 14.0 | | 19.5 | 16.5 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 5.9 | 2.6 | | 2.3 | 4.3 | | 2.0 | 2.3 | | 23.0 | 0.5 | |
| Delay (s) | 57.4 | 55.6 | | 45.6 | 53.0 | | 11.3 | 16.3 | | 42.6 | 17.0 | |
| Level of Service | E | E | | D | D | | B | B | | D | B | |
| Approach Delay (s) | | 55.7 | | | 52.1 | | | 15.5 | | | 18.8 | |
| Approach LOS | | E | | | D | | | B | | | B | |

Intersection Summary

| | | | |
|-----------------------------------|--------|---------------------------|------|
| HCM 2000 Control Delay | 26.7 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.79 | | |
| Actuated Cycle Length (s) | 135.0 | Sum of lost time (s) | 18.9 |
| Intersection Capacity Utilization | 102.3% | ICU Level of Service | G |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
13: Hanover Road/Highview Trail & Howden Blvd

<Existing>PM
03-11-2020

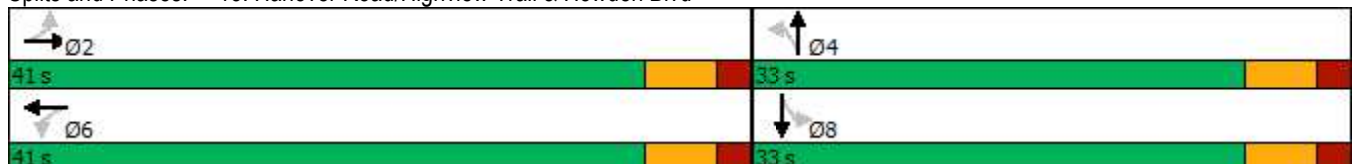


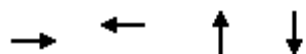
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↕↕ | | ↕↕ | | ↕↕ | | ↕↕ |
| Traffic Volume (vph) | 19 | 245 | 12 | 469 | 129 | 2 | 9 | 2 |
| Future Volume (vph) | 19 | 245 | 12 | 469 | 129 | 2 | 9 | 2 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (s) | 41.0 | 41.0 | 41.0 | 41.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (%) | 55.4% | 55.4% | 55.4% | 55.4% | 44.6% | 44.6% | 44.6% | 44.6% |
| 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | Max | Max | Max | Max | None | None | None | None |
| Act Effct Green (s) | | 38.5 | | 38.5 | | 10.7 | | 10.7 |
| Actuated g/C Ratio | | 0.63 | | 0.63 | | 0.17 | | 0.17 |
| v/c Ratio | | 0.23 | | 0.25 | | 0.35 | | 0.14 |
| Control Delay | | 3.6 | | 5.7 | | 19.7 | | 11.8 |
| Queue Delay | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| Total Delay | | 3.6 | | 5.7 | | 19.7 | | 11.8 |
| LOS | | A | | A | | B | | B |
| Approach Delay | | 3.6 | | 5.7 | | 19.7 | | 11.8 |
| Approach LOS | | A | | A | | B | | B |

Intersection Summary

Cycle Length: 74
 Actuated Cycle Length: 61.3
 Natural Cycle: 70
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.35
 Intersection Signal Delay: 7.1
 Intersection Capacity Utilization 51.8%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 13: Hanover Road/Highview Trail & Howden Blvd





| Lane Group | EBT | WBT | NBT | SBT |
|------------------------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 457 | 535 | 168 | 40 |
| v/c Ratio | 0.23 | 0.25 | 0.35 | 0.14 |
| Control Delay | 3.6 | 5.7 | 19.7 | 11.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 3.6 | 5.7 | 19.7 | 11.8 |
| Queue Length 50th (m) | 5.8 | 11.5 | 6.8 | 1.1 |
| Queue Length 95th (m) | 12.3 | 20.2 | 13.9 | 7.3 |
| Internal Link Dist (m) | 187.9 | 607.3 | 181.5 | 108.7 |
| Turn Bay Length (m) | | | | |
| Base Capacity (vph) | 2020 | 2133 | 1166 | 696 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.23 | 0.25 | 0.14 | 0.06 |
| Intersection Summary | | | | |

HCM Signalized Intersection Capacity Analysis
 13: Hanover Road/Highview Trail & Howden Blvd

<Existing>PM
 03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|------|------|---------------------------|------|------|------|------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | | ↕↕ | | | ↕↕ | |
| Traffic Volume (vph) | 19 | 245 | 156 | 12 | 469 | 11 | 129 | 2 | 24 | 9 | 2 | 26 |
| Future Volume (vph) | 19 | 245 | 156 | 12 | 469 | 11 | 129 | 2 | 24 | 9 | 2 | 26 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | | 0.95 | | | 1.00 | |
| Frbp, ped/bikes | | 0.99 | | | 1.00 | | | 1.00 | | | 1.00 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | | 1.00 | | | 1.00 | |
| Frt | | 0.94 | | | 1.00 | | | 0.98 | | | 0.91 | |
| Flt Protected | | 1.00 | | | 1.00 | | | 0.96 | | | 0.99 | |
| Satd. Flow (prot) | | 3371 | | | 3597 | | | 3332 | | | 1717 | |
| Flt Permitted | | 0.92 | | | 0.94 | | | 0.75 | | | 0.89 | |
| Satd. Flow (perm) | | 3117 | | | 3393 | | | 2603 | | | 1541 | |
| 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) | 21 | 266 | 170 | 13 | 510 | 12 | 140 | 2 | 26 | 10 | 2 | 28 |
| RTOR Reduction (vph) | 0 | 63 | 0 | 0 | 1 | 0 | 0 | 21 | 0 | 0 | 23 | 0 |
| Lane Group Flow (vph) | 0 | 394 | 0 | 0 | 534 | 0 | 0 | 147 | 0 | 0 | 17 | 0 |
| Confl. Peds. (#/hr) | 6 | | 9 | 9 | | 6 | | | 4 | 4 | | |
| Heavy Vehicles (%) | 0% | 1% | 2% | 0% | 1% | 0% | 3% | 0% | 0% | 0% | 0% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | |
| Actuated Green, G (s) | | 38.5 | | | 38.5 | | | 10.7 | | | 10.7 | |
| Effective Green, g (s) | | 38.5 | | | 38.5 | | | 10.7 | | | 10.7 | |
| Actuated g/C Ratio | | 0.63 | | | 0.63 | | | 0.17 | | | 0.17 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | | 1960 | | | 2134 | | | 455 | | | 269 | |
| v/s Ratio Prot | | | | | | | | | | | | |
| v/s Ratio Perm | | 0.13 | | | 0.16 | | | 0.06 | | | 0.01 | |
| v/c Ratio | | 0.20 | | | 0.25 | | | 0.32 | | | 0.06 | |
| Uniform Delay, d1 | | 4.8 | | | 5.0 | | | 22.1 | | | 21.1 | |
| Progression Factor | | 1.00 | | | 1.00 | | | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | | 0.2 | | | 0.3 | | | 0.9 | | | 0.2 | |
| Delay (s) | | 5.1 | | | 5.3 | | | 22.9 | | | 21.3 | |
| Level of Service | | A | | | A | | | C | | | C | |
| Approach Delay (s) | | 5.1 | | | 5.3 | | | 22.9 | | | 21.3 | |
| Approach LOS | | A | | | A | | | C | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 8.2 | | | | HCM 2000 Level of Service | | | A | | |
| HCM 2000 Volume to Capacity ratio | | | 0.27 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 61.2 | | | | Sum of lost time (s) | | 12.0 | | | |
| Intersection Capacity Utilization | | | 51.8% | | | | ICU Level of Service | | | A | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings
14: Central Park Drive & Hanover Road

<Existing>PM
03-11-2020

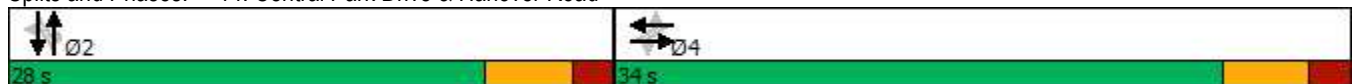


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | ↕↕ | | ↕↕ | ↕ | ↕↕ | | ↕↕ |
| Traffic Volume (vph) | 52 | 2 | 33 | 12 | 392 | 778 | 17 | 350 |
| Future Volume (vph) | 52 | 2 | 33 | 12 | 392 | 778 | 17 | 350 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 4 | | 4 | | 2 | | 2 |
| Permitted Phases | 4 | | 4 | | 2 | | 2 | |
| Detector Phase | 4 | 4 | 4 | 4 | 2 | 2 | 2 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (%) | 54.8% | 54.8% | 54.8% | 54.8% | 45.2% | 45.2% | 45.2% | 45.2% |
| 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 |
| Total Lost Time (s) | | 6.0 | | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | Max | Max | Max | Max |
| Act Effct Green (s) | | 9.6 | | 9.6 | 23.6 | 23.6 | | 23.6 |
| Actuated g/C Ratio | | 0.21 | | 0.21 | 0.52 | 0.52 | | 0.52 |
| v/c Ratio | | 0.37 | | 0.13 | 0.91 | 0.46 | | 0.27 |
| Control Delay | | 5.9 | | 10.6 | 42.1 | 8.3 | | 6.7 |
| Queue Delay | | 0.0 | | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | | 5.9 | | 10.6 | 42.1 | 8.3 | | 6.7 |
| LOS | | A | | B | D | A | | A |
| Approach Delay | | 5.9 | | 10.6 | | 19.5 | | 6.7 |
| Approach LOS | | A | | B | | B | | A |

Intersection Summary

| | |
|---|------------------------|
| Cycle Length: 62 | |
| Actuated Cycle Length: 45.3 | |
| Natural Cycle: 90 | |
| Control Type: Semi Act-Uncoord | |
| Maximum v/c Ratio: 0.91 | |
| Intersection Signal Delay: 14.6 | Intersection LOS: B |
| Intersection Capacity Utilization 83.5% | ICU Level of Service E |
| Analysis Period (min) 15 | |

Splits and Phases: 14: Central Park Drive & Hanover Road



Queues
14: Central Park Drive & Hanover Road

<Existing>PM
03-11-2020



| Lane Group | EBT | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 268 | 72 | 426 | 863 | 450 |
| v/c Ratio | 0.37 | 0.13 | 0.91 | 0.46 | 0.27 |
| Control Delay | 5.9 | 10.6 | 42.1 | 8.3 | 6.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 5.9 | 10.6 | 42.1 | 8.3 | 6.7 |
| Queue Length 50th (m) | 1.8 | 1.5 | 24.8 | 18.2 | 7.8 |
| Queue Length 95th (m) | 8.3 | 5.0 | #80.5 | 36.2 | 17.5 |
| Internal Link Dist (m) | 532.7 | 113.0 | | 177.3 | 377.5 |
| Turn Bay Length (m) | | | 44.5 | | |
| Base Capacity (vph) | 1737 | 1562 | 466 | 1856 | 1663 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.15 | 0.05 | 0.91 | 0.46 | 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
14: Central Park Drive & Hanover Road

<Existing>PM
03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|------|------|------|------|------|
| Lane Configurations | | ↕↕ | | | ↕↕ | | ↕ | ↕↕ | | | ↕↕ | |
| Traffic Volume (vph) | 52 | 2 | 192 | 33 | 12 | 21 | 392 | 778 | 16 | 17 | 350 | 48 |
| Future Volume (vph) | 52 | 2 | 192 | 33 | 12 | 21 | 392 | 778 | 16 | 17 | 350 | 48 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Lane Util. Factor | | 0.95 | | | 0.95 | | 1.00 | 0.95 | | | 0.95 | |
| Frbp, ped/bikes | | 0.99 | | | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Flpb, ped/bikes | | 1.00 | | | 1.00 | | 0.99 | 1.00 | | | 1.00 | |
| Frt | | 0.88 | | | 0.95 | | 1.00 | 1.00 | | | 0.98 | |
| Flt Protected | | 0.99 | | | 0.98 | | 0.95 | 1.00 | | | 1.00 | |
| Satd. Flow (prot) | | 3035 | | | 3368 | | 1735 | 3558 | | | 3480 | |
| Flt Permitted | | 0.87 | | | 0.72 | | 0.49 | 1.00 | | | 0.91 | |
| Satd. Flow (perm) | | 2675 | | | 2501 | | 898 | 3558 | | | 3170 | |
| 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) | 57 | 2 | 209 | 36 | 13 | 23 | 426 | 846 | 17 | 18 | 380 | 52 |
| RTOR Reduction (vph) | 0 | 165 | 0 | 0 | 18 | 0 | 0 | 2 | 0 | 0 | 12 | 0 |
| Lane Group Flow (vph) | 0 | 103 | 0 | 0 | 54 | 0 | 426 | 861 | 0 | 0 | 438 | 0 |
| Confl. Peds. (#/hr) | 5 | | 13 | 13 | | 5 | 26 | | 11 | 11 | | 26 |
| Heavy Vehicles (%) | 2% | 0% | 4% | 0% | 0% | 0% | 2% | 2% | 13% | 0% | 3% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 4 | | | 2 | | | 2 | |
| Permitted Phases | 4 | | | 4 | | | 2 | | | 2 | | |
| Actuated Green, G (s) | | 9.6 | | | 9.6 | | 23.6 | 23.6 | | | 23.6 | |
| Effective Green, g (s) | | 9.6 | | | 9.6 | | 23.6 | 23.6 | | | 23.6 | |
| Actuated g/C Ratio | | 0.21 | | | 0.21 | | 0.52 | 0.52 | | | 0.52 | |
| Clearance Time (s) | | 6.0 | | | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | | 5.0 | | | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | | 568 | | | 531 | | 468 | 1857 | | | 1655 | |
| v/s Ratio Prot | | | | | | | | 0.24 | | | | |
| v/s Ratio Perm | | c0.04 | | | 0.02 | | c0.47 | | | | 0.14 | |
| v/c Ratio | | 0.18 | | | 0.10 | | 0.91 | 0.46 | | | 0.26 | |
| Uniform Delay, d1 | | 14.6 | | | 14.3 | | 9.8 | 6.8 | | | 6.0 | |
| Progression Factor | | 1.00 | | | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | | 0.3 | | | 0.2 | | 24.3 | 0.8 | | | 0.4 | |
| Delay (s) | | 14.9 | | | 14.5 | | 34.2 | 7.6 | | | 6.4 | |
| Level of Service | | B | | | B | | C | A | | | A | |
| Approach Delay (s) | | 14.9 | | | 14.5 | | | 16.4 | | | 6.4 | |
| Approach LOS | | B | | | B | | | B | | | A | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 14.0 | | | | HCM 2000 Level of Service | | | | B | |
| HCM 2000 Volume to Capacity ratio | | | 0.70 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 45.2 | | | | Sum of lost time (s) | | | 12.0 | | |
| Intersection Capacity Utilization | | | 83.5% | | | | ICU Level of Service | | | E | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings
15: Central Park Drive & Howden Blvd

<Existing>PM
03-11-2020



| Lane Group | EBL | EBR | NBL | NBT | SBT |
|----------------------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | |
| Traffic Volume (vph) | 110 | 78 | 266 | 493 | 242 |
| Future Volume (vph) | 110 | 78 | 266 | 493 | 242 |
| Turn Type | Prot | Prot | Perm | NA | NA |
| Protected Phases | 4 | 4 | | 2 | 2 |
| Permitted Phases | | | 2 | | |
| Detector Phase | 4 | 4 | 2 | 2 | 2 |
| Switch Phase | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 54.5% | 54.5% | 45.5% | 45.5% | 45.5% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | |
| Lead-Lag Optimize? | | | | | |
| Recall Mode | None | None | Max | Max | Max |
| Act Effct Green (s) | 10.4 | 10.4 | 29.4 | 29.4 | 29.4 |
| Actuated g/C Ratio | 0.22 | 0.22 | 0.62 | 0.62 | 0.62 |
| v/c Ratio | 0.30 | 0.20 | 0.57 | 0.24 | 0.26 |
| Control Delay | 17.4 | 5.7 | 16.4 | 6.5 | 3.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.4 | 5.7 | 16.4 | 6.5 | 3.5 |
| LOS | B | A | B | A | A |
| Approach Delay | 12.5 | | | 9.9 | 3.5 |
| Approach LOS | B | | | A | A |

Intersection Summary

Cycle Length: 66
 Actuated Cycle Length: 47.6
 Natural Cycle: 75
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.57
 Intersection Signal Delay: 8.1
 Intersection Capacity Utilization 58.7%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service B

Splits and Phases: 15: Central Park Drive & Howden Blvd



Queues

<Existing>PM

15: Central Park Drive & Howden Blvd

03-11-2020



| Lane Group | EBL | EBR | NBL | NBT | SBT |
|------------------------|-------|------|-------|-------|-------|
| Lane Group Flow (vph) | 120 | 85 | 289 | 536 | 543 |
| v/c Ratio | 0.30 | 0.20 | 0.57 | 0.24 | 0.26 |
| Control Delay | 17.4 | 5.7 | 16.4 | 6.5 | 3.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.4 | 5.7 | 16.4 | 6.5 | 3.5 |
| Queue Length 50th (m) | 8.1 | 0.0 | 15.4 | 11.4 | 5.2 |
| Queue Length 95th (m) | 18.2 | 7.4 | #52.3 | 21.0 | 12.5 |
| Internal Link Dist (m) | 607.3 | | | 377.5 | 147.1 |
| Turn Bay Length (m) | | | 65.0 | | |
| Base Capacity (vph) | 1141 | 1042 | 507 | 2210 | 2128 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.11 | 0.08 | 0.57 | 0.24 | 0.26 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
15: Central Park Drive & Howden Blvd

<Existing>PM
03-11-2020



















| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|------------------------|-------|------|-------|------|------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 110 | 78 | 266 | 493 | 242 | 258 |
| Future Volume (vph) | 110 | 78 | 266 | 493 | 242 | 258 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 0.95 | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | 0.99 | 1.00 | 1.00 | |
| Frt | 1.00 | 0.85 | 1.00 | 1.00 | 0.92 | |
| Flt Protected | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 | |
| Satd. Flow (prot) | 1807 | 1601 | 1740 | 3579 | 3279 | |
| Flt Permitted | 0.95 | 1.00 | 0.45 | 1.00 | 1.00 | |
| Satd. Flow (perm) | 1807 | 1601 | 823 | 3579 | 3279 | |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj. Flow (vph) | 120 | 85 | 289 | 536 | 263 | 280 |
| RTOR Reduction (vph) | 0 | 70 | 0 | 0 | 119 | 0 |
| Lane Group Flow (vph) | 120 | 15 | 289 | 536 | 424 | 0 |
| Confl. Peds. (#/hr) | 4 | 4 | 20 | | | 20 |
| Heavy Vehicles (%) | 1% | 2% | 2% | 2% | 3% | 0% |
| Turn Type | Prot | Prot | Perm | NA | NA | |
| Protected Phases | 4 | 4 | | 2 | 2 | |
| Permitted Phases | | | 2 | | | |
| Actuated Green, G (s) | 8.7 | 8.7 | 28.1 | 28.1 | 28.1 | |
| Effective Green, g (s) | 8.7 | 8.7 | 28.1 | 28.1 | 28.1 | |
| Actuated g/C Ratio | 0.18 | 0.18 | 0.58 | 0.58 | 0.58 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 322 | 285 | 473 | 2060 | 1888 | |
| v/s Ratio Prot | c0.07 | 0.01 | | 0.15 | 0.13 | |
| v/s Ratio Perm | | | c0.35 | | | |
| v/c Ratio | 0.37 | 0.05 | 0.61 | 0.26 | 0.22 | |
| Uniform Delay, d1 | 17.6 | 16.6 | 6.8 | 5.2 | 5.0 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | 1.5 | 0.2 | 5.8 | 0.3 | 0.3 | |
| Delay (s) | 19.2 | 16.8 | 12.6 | 5.5 | 5.3 | |
| Level of Service | B | B | B | A | A | |
| Approach Delay (s) | 18.2 | | | 8.0 | 5.3 | |
| Approach LOS | B | | | A | A | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 8.4 | HCM 2000 Level of Service | A |
| HCM 2000 Volume to Capacity ratio | 0.55 | | |
| Actuated Cycle Length (s) | 48.8 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 58.7% | ICU Level of Service | B |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

HCM Unsignalized Intersection Capacity Analysis
 16: Isabella Street & Vodden Street West

<Existing>PM
 03-11-2020

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | | |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 20 | 235 | 8 | 25 | 375 | 59 | 30 | 164 | 59 | 52 | 52 | 39 |
| Future Volume (vph) | 20 | 235 | 8 | 25 | 375 | 59 | 30 | 164 | 59 | 52 | 52 | 39 |
| 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) | 22 | 255 | 9 | 27 | 408 | 64 | 33 | 178 | 64 | 57 | 57 | 42 |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | | |
| Volume Total (vph) | 286 | 231 | 268 | 275 | 156 | | | | | | | |
| Volume Left (vph) | 22 | 27 | 0 | 33 | 57 | | | | | | | |
| Volume Right (vph) | 9 | 0 | 64 | 64 | 42 | | | | | | | |
| Hadj (s) | 0.04 | 0.07 | -0.15 | -0.12 | -0.09 | | | | | | | |
| Departure Headway (s) | 6.3 | 6.5 | 6.3 | 6.3 | 6.7 | | | | | | | |
| Degree Utilization, x | 0.50 | 0.42 | 0.47 | 0.48 | 0.29 | | | | | | | |
| Capacity (veh/h) | 530 | 526 | 547 | 524 | 466 | | | | | | | |
| Control Delay (s) | 15.6 | 13.0 | 13.6 | 15.0 | 12.4 | | | | | | | |
| Approach Delay (s) | 15.6 | 13.3 | | 15.0 | 12.4 | | | | | | | |
| Approach LOS | C | B | | C | B | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 14.1 | | | | | | | | | |
| Level of Service | | | B | | | | | | | | | |
| Intersection Capacity Utilization | | | 55.2% | ICU Level of Service | B | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 17: Lansdowne Drive/Lakeridge Drive & Vodden Street East

<Existing>PM
 03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↔↔ | | | ↔↔ | | | ↔ | | | ↔ | |
| Traffic Volume (veh/h) | 23 | 566 | 10 | 13 | 1041 | 10 | 2 | 1 | 11 | 12 | 2 | 12 |
| Future Volume (Veh/h) | 23 | 566 | 10 | 13 | 1041 | 10 | 2 | 1 | 11 | 12 | 2 | 12 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 25 | 615 | 11 | 14 | 1132 | 11 | 2 | 1 | 12 | 13 | 2 | 13 |
| Pedestrians | | 2 | | | 5 | | | 3 | | | 7 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 0 | | | 0 | | | 0 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | 290 | | | | | | | |
| pX, platoon unblocked | 0.84 | | | | | | 0.84 | 0.84 | | 0.84 | 0.84 | 0.84 |
| vC, conflicting volume | 1150 | | | 629 | | | 1284 | 1852 | 321 | 1548 | 1852 | 580 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 791 | | | 629 | | | 951 | 1629 | 321 | 1266 | 1629 | 112 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 96 | | | 99 | | | 99 | 99 | 98 | 87 | 98 | 98 |
| cM capacity (veh/h) | 697 | | | 960 | | | 167 | 81 | 676 | 98 | 81 | 770 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 332 | 318 | 580 | 577 | 15 | 28 | | | | | | |
| Volume Left | 25 | 0 | 14 | 0 | 2 | 13 | | | | | | |
| Volume Right | 0 | 11 | 0 | 11 | 12 | 13 | | | | | | |
| cSH | 697 | 1700 | 960 | 1700 | 357 | 161 | | | | | | |
| Volume to Capacity | 0.04 | 0.19 | 0.01 | 0.34 | 0.04 | 0.17 | | | | | | |
| Queue Length 95th (m) | 0.8 | 0.0 | 0.3 | 0.0 | 1.0 | 4.6 | | | | | | |
| Control Delay (s) | 1.2 | 0.0 | 0.4 | 0.0 | 15.5 | 31.9 | | | | | | |
| Lane LOS | A | | A | | C | D | | | | | | |
| Approach Delay (s) | 0.6 | | 0.2 | | 15.5 | 31.9 | | | | | | |
| Approach LOS | | | | | C | D | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 0.9 | | | | | | | | | |
| Intersection Capacity Utilization | | | 49.8% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 18: Howden Blvd & Lindridge Avenue/Leander Street

<Existing>PM
 03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 0 | 0 | 1 | 19 | 419 | 8 | 2 | 169 | 3 |
| Future Volume (Veh/h) | 0 | 0 | 0 | 0 | 0 | 1 | 19 | 419 | 8 | 2 | 169 | 3 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 0 | 0 | 0 | 0 | 1 | 21 | 455 | 9 | 2 | 184 | 3 |
| Pedestrians | | | | | 2 | | | | | | | |
| Lane Width (m) | | | | | 3.7 | | | | | | | |
| Walking Speed (m/s) | | | | | 1.1 | | | | | | | |
| Percent Blockage | | | | | 0 | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage veh | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | 142 | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 460 | 698 | 94 | 600 | 694 | 234 | 187 | | | 466 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 460 | 698 | 94 | 600 | 694 | 234 | 187 | | | 466 | | |
| tC, single (s) | 7.5 | 6.5 | 6.9 | 7.5 | 6.5 | 6.9 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 100 | 100 | 100 | 100 | 100 | 100 | 98 | | | 100 | | |
| cM capacity (veh/h) | 477 | 356 | 945 | 379 | 358 | 773 | 1399 | | | 1104 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 0 | 1 | 248 | 236 | 94 | 95 | | | | | | |
| Volume Left | 0 | 0 | 21 | 0 | 2 | 0 | | | | | | |
| Volume Right | 0 | 1 | 0 | 9 | 0 | 3 | | | | | | |
| cSH | 1700 | 773 | 1399 | 1700 | 1104 | 1700 | | | | | | |
| Volume to Capacity | 0.00 | 0.00 | 0.02 | 0.14 | 0.00 | 0.06 | | | | | | |
| Queue Length 95th (m) | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | | | | | | |
| Control Delay (s) | 0.0 | 9.7 | 0.8 | 0.0 | 0.2 | 0.0 | | | | | | |
| Lane LOS | A | A | A | | A | | | | | | | |
| Approach Delay (s) | 0.0 | 9.7 | 0.4 | | 0.1 | | | | | | | |
| Approach LOS | A | A | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 0.3 | | | | | | | | | |
| Intersection Capacity Utilization | | | 30.6% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 19: Hanover Road & Homeland Ct/Huntington Ct

<Existing>PM
 03-11-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Traffic Volume (veh/h) | 9 | 0 | 4 | 8 | 1 | 13 | 7 | 142 | 8 | 21 | 143 | 13 |
| Future Volume (Veh/h) | 9 | 0 | 4 | 8 | 1 | 13 | 7 | 142 | 8 | 21 | 143 | 13 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 10 | 0 | 4 | 9 | 1 | 14 | 8 | 154 | 9 | 23 | 155 | 14 |
| Pedestrians | | 21 | | | 1 | | | 10 | | | | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.7 | | | | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | | |
| Percent Blockage | | 2 | | | 0 | | | 1 | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage veh | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | 205 | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 336 | 409 | 116 | 313 | 412 | 82 | 190 | | | 164 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 336 | 409 | 116 | 313 | 412 | 82 | 190 | | | 164 | | |
| tC, single (s) | 7.5 | 6.5 | 7.4 | 7.5 | 6.5 | 6.9 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.5 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 98 | 100 | 100 | 98 | 100 | 99 | 99 | | | 98 | | |
| cM capacity (veh/h) | 559 | 508 | 822 | 593 | 511 | 966 | 1369 | | | 1425 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 14 | 24 | 85 | 86 | 100 | 92 | | | | | | |
| Volume Left | 10 | 9 | 8 | 0 | 23 | 0 | | | | | | |
| Volume Right | 4 | 14 | 0 | 9 | 0 | 14 | | | | | | |
| cSH | 615 | 759 | 1369 | 1700 | 1425 | 1700 | | | | | | |
| Volume to Capacity | 0.02 | 0.03 | 0.01 | 0.05 | 0.02 | 0.05 | | | | | | |
| Queue Length 95th (m) | 0.5 | 0.7 | 0.1 | 0.0 | 0.4 | 0.0 | | | | | | |
| Control Delay (s) | 11.0 | 9.9 | 0.8 | 0.0 | 1.8 | 0.0 | | | | | | |
| Lane LOS | B | A | A | | A | | | | | | | |
| Approach Delay (s) | 11.0 | 9.9 | 0.4 | | 1.0 | | | | | | | |
| Approach LOS | B | A | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 1.6 | | | | | | | | | |
| Intersection Capacity Utilization | | | 30.1% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

Timings
7: Rutherford Road North & Vodden Street East

<Existing>PM
06-01-2020

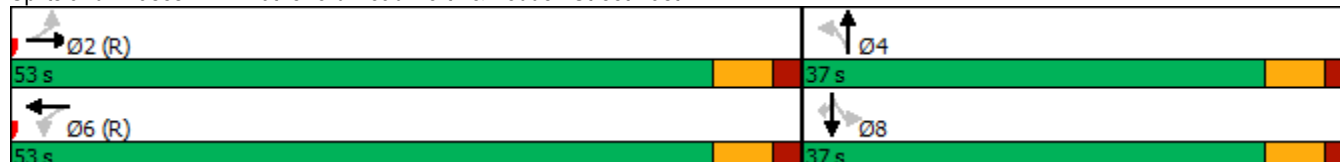


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ | ↕ | ↖ |
| Traffic Volume (vph) | 173 | 483 | 68 | 604 | 165 | 447 | 69 | 173 | 82 |
| Future Volume (vph) | 173 | 483 | 68 | 604 | 165 | 447 | 69 | 173 | 82 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | 6 | | 4 | | 8 | |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | | 8 |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 53.0 | 53.0 | 53.0 | 53.0 | 37.0 | 37.0 | 37.0 | 37.0 | 37.0 |
| Total Split (%) | 58.9% | 58.9% | 58.9% | 58.9% | 41.1% | 41.1% | 41.1% | 41.1% | 41.1% |
| Yellow Time (s) | 4.0 | 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 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 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 | 6.0 |
| Lead/Lag | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 48.1 | 48.1 | 48.1 | 48.1 | 29.9 | 29.9 | 29.9 | 29.9 | 29.9 |
| Actuated g/C Ratio | 0.53 | 0.53 | 0.53 | 0.53 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| v/c Ratio | 0.55 | 0.31 | 0.17 | 0.41 | 0.41 | 0.89 | 0.78 | 0.28 | 0.15 |
| Control Delay | 24.4 | 12.8 | 15.4 | 14.8 | 26.5 | 46.3 | 80.1 | 23.2 | 5.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 24.4 | 12.8 | 15.4 | 14.8 | 26.5 | 46.3 | 80.1 | 23.2 | 5.6 |
| LOS | C | B | B | B | C | D | F | C | A |
| Approach Delay | | 15.5 | | 14.9 | | 41.7 | | 30.9 | |
| Approach LOS | | B | | B | | D | | C | |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 24.3
 Intersection Capacity Utilization 90.9%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service E

Splits and Phases: 7: Rutherford Road North & Vodden Street East



Queues
7: Rutherford Road North & Vodden Street East

<Existing>PM
06-01-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT | SBR |
|------------------------|------|-------|------|-------|------|--------|-------|-------|------|
| Lane Group Flow (vph) | 175 | 581 | 69 | 765 | 167 | 550 | 70 | 175 | 83 |
| v/c Ratio | 0.55 | 0.31 | 0.17 | 0.41 | 0.41 | 0.89 | 0.78 | 0.28 | 0.15 |
| Control Delay | 24.4 | 12.8 | 15.4 | 14.8 | 26.5 | 46.3 | 80.1 | 23.2 | 5.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 24.4 | 12.8 | 15.4 | 14.8 | 26.5 | 46.3 | 80.1 | 23.2 | 5.6 |
| Queue Length 50th (m) | 22.8 | 33.1 | 5.9 | 37.1 | 21.7 | 85.8 | 10.6 | 21.6 | 0.0 |
| Queue Length 95th (m) | 46.2 | 49.0 | 16.8 | 63.9 | 38.9 | #142.6 | #34.2 | 37.2 | 9.1 |
| Internal Link Dist (m) | | 358.4 | | 418.5 | | 288.8 | | 340.1 | |
| Turn Bay Length (m) | 50.0 | | 48.5 | | 47.5 | | 41.5 | | 44.5 |
| Base Capacity (vph) | 316 | 1858 | 406 | 1879 | 421 | 639 | 93 | 643 | 586 |
| 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 | 0.55 | 0.31 | 0.17 | 0.41 | 0.40 | 0.86 | 0.75 | 0.27 | 0.14 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
7: Rutherford Road North & Vodden Street East

<Existing>PM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|------|------|------|------|------|------|-------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 97 | 69 | 173 | 82 |
| Future Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 97 | 69 | 173 | 82 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Lane Util. Factor | 1.00 | 0.95 | | 1.00 | 0.95 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 1.00 | 0.99 |
| Flpb, ped/bikes | 1.00 | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Frt | 1.00 | 0.98 | | 1.00 | 0.97 | | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1781 | 3447 | | 1764 | 3471 | | 1824 | 1832 | | 1779 | 1868 | 1546 |
| Flt Permitted | 0.32 | 1.00 | | 0.41 | 1.00 | | 0.64 | 1.00 | | 0.15 | 1.00 | 1.00 |
| Satd. Flow (perm) | 592 | 3447 | | 761 | 3471 | | 1222 | 1832 | | 272 | 1868 | 1546 |
| Peak-hour factor, PHF | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Adj. Flow (vph) | 175 | 488 | 93 | 69 | 610 | 155 | 167 | 452 | 98 | 70 | 175 | 83 |
| RTOR Reduction (vph) | 0 | 17 | 0 | 0 | 24 | 0 | 0 | 9 | 0 | 0 | 0 | 55 |
| Lane Group Flow (vph) | 175 | 564 | 0 | 69 | 741 | 0 | 167 | 541 | 0 | 70 | 175 | 28 |
| Confl. Peds. (#/hr) | 5 | | 18 | 18 | | 5 | 1 | | 11 | 11 | | 1 |
| Heavy Vehicles (%) | 0% | 2% | 3% | 0% | 1% | 1% | 0% | 1% | 0% | 0% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 48.1 | 48.1 | | 48.1 | 48.1 | | 29.9 | 29.9 | | 29.9 | 29.9 | 29.9 |
| Effective Green, g (s) | 48.1 | 48.1 | | 48.1 | 48.1 | | 29.9 | 29.9 | | 29.9 | 29.9 | 29.9 |
| Actuated g/C Ratio | 0.53 | 0.53 | | 0.53 | 0.53 | | 0.33 | 0.33 | | 0.33 | 0.33 | 0.33 |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 316 | 1842 | | 406 | 1855 | | 405 | 608 | | 90 | 620 | 513 |
| v/s Ratio Prot | | 0.16 | | | 0.21 | | | c0.30 | | | 0.09 | |
| v/s Ratio Perm | c0.30 | | | 0.09 | | | 0.14 | | | 0.26 | | 0.02 |
| v/c Ratio | 0.55 | 0.31 | | 0.17 | 0.40 | | 0.41 | 0.89 | | 0.78 | 0.28 | 0.05 |
| Uniform Delay, d1 | 13.9 | 11.7 | | 10.7 | 12.4 | | 23.3 | 28.5 | | 27.1 | 22.1 | 20.4 |
| Progression Factor | 1.12 | 1.10 | | 1.22 | 1.19 | | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 6.5 | 0.4 | | 0.9 | 0.6 | | 1.4 | 16.1 | | 38.0 | 0.5 | 0.1 |
| Delay (s) | 22.0 | 13.2 | | 14.0 | 15.4 | | 24.7 | 44.6 | | 65.1 | 22.7 | 20.5 |
| Level of Service | C | B | | B | B | | C | D | | E | C | C |
| Approach Delay (s) | | 15.3 | | | 15.3 | | | 40.0 | | | 31.2 | |
| Approach LOS | | B | | | B | | | D | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 24.0 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.68 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 90.9% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

APPENDIX

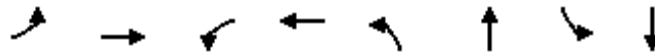
C FUTURE CONDITIONS SYNCHRO REPORTS

Timings

<Future>AM

1: Main Street & Vodden Street West/Vodden Street East

03-12-2020

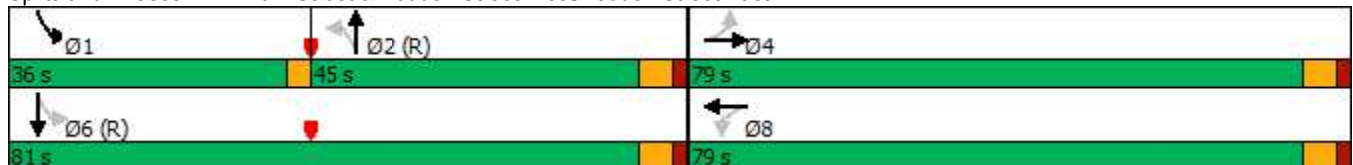


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↗ | ↖ | ↗ | ↖ | ↗ |
| Traffic Volume (vph) | 17 | 512 | 75 | 161 | 23 | 417 | 297 | 1088 |
| Future Volume (vph) | 17 | 512 | 75 | 161 | 23 | 417 | 297 | 1088 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | pm+pt | NA |
| Protected Phases | | 4 | | 8 | | 2 | 1 | 6 |
| Permitted Phases | 4 | | 8 | | 2 | | 6 | |
| Detector Phase | 4 | 4 | 8 | 8 | 2 | 2 | 1 | 6 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 |
| Minimum Split (s) | 25.0 | 25.0 | 25.0 | 25.0 | 27.0 | 27.0 | 9.0 | 27.0 |
| Total Split (s) | 79.0 | 79.0 | 79.0 | 79.0 | 45.0 | 45.0 | 36.0 | 81.0 |
| Total Split (%) | 49.4% | 49.4% | 49.4% | 49.4% | 28.1% | 28.1% | 22.5% | 50.6% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 3.0 | 6.0 |
| Lead/Lag | | | | | Lag | Lag | Lead | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | C-Max | C-Max | None | C-Max |
| Act Effct Green (s) | 61.9 | 61.9 | 61.9 | 61.9 | 61.7 | 61.7 | 89.1 | 86.1 |
| Actuated g/C Ratio | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.56 | 0.54 |
| v/c Ratio | 0.05 | 0.85 | 0.91 | 0.36 | 0.18 | 0.43 | 0.65 | 0.63 |
| Control Delay | 27.5 | 55.9 | 117.7 | 32.7 | 45.4 | 39.5 | 27.6 | 28.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 27.5 | 55.9 | 117.7 | 32.7 | 45.4 | 39.5 | 27.6 | 28.9 |
| LOS | C | E | F | C | D | D | C | C |
| Approach Delay | | 55.1 | | 53.9 | | 39.8 | | 28.6 |
| Approach LOS | | E | | D | | D | | C |

Intersection Summary

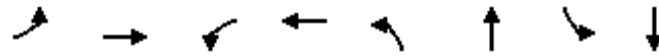
Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 69 (43%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 38.8
 Intersection LOS: D
 Intersection Capacity Utilization 93.5%
 ICU Level of Service F
 Analysis Period (min) 15

Splits and Phases: 1: Main Street & Vodden Street West/Vodden Street East



1: Main Street & Vodden Street West/Vodden Street East

03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|-------|-------|-------|------|-------|------|-------|
| Lane Group Flow (vph) | 18 | 604 | 82 | 247 | 25 | 540 | 323 | 1193 |
| v/c Ratio | 0.05 | 0.85 | 0.91 | 0.36 | 0.18 | 0.43 | 0.65 | 0.63 |
| Control Delay | 27.5 | 55.9 | 117.7 | 32.7 | 45.4 | 39.5 | 27.6 | 28.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 27.5 | 55.9 | 117.7 | 32.7 | 45.4 | 39.5 | 27.6 | 28.9 |
| Queue Length 50th (m) | 3.5 | 172.4 | 24.2 | 51.3 | 5.3 | 64.8 | 55.1 | 137.5 |
| Queue Length 95th (m) | 8.3 | 200.3 | #55.7 | 66.7 | 16.6 | 99.7 | 87.6 | 183.6 |
| Internal Link Dist (m) | | 98.5 | | 228.5 | | 261.4 | | 232.7 |
| Turn Bay Length (m) | 42.0 | | 100.0 | | 48.5 | | 22.5 | |
| Base Capacity (vph) | 433 | 840 | 107 | 807 | 137 | 1266 | 578 | 1904 |
| 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 | 0.04 | 0.72 | 0.77 | 0.31 | 0.18 | 0.43 | 0.56 | 0.63 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 1: Main Street & Vodden Street West/Vodden Street East

<Future>AM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|-------|------|------|------|------|------|-------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 17 | 512 | 43 | 75 | 161 | 66 | 23 | 417 | 80 | 297 | 1088 | 9 |
| Future Volume (vph) | 17 | 512 | 43 | 75 | 161 | 66 | 23 | 417 | 80 | 297 | 1088 | 9 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.99 | 1.00 | |
| Fr | 1.00 | 0.99 | | 1.00 | 0.96 | | 1.00 | 0.98 | | 1.00 | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1766 | 1838 | | 1733 | 1750 | | 1682 | 3261 | | 1737 | 3538 | |
| Flt Permitted | 0.51 | 1.00 | | 0.13 | 1.00 | | 0.20 | 1.00 | | 0.34 | 1.00 | |
| Satd. Flow (perm) | 951 | 1838 | | 236 | 1750 | | 356 | 3261 | | 628 | 3538 | |
| 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) | 18 | 557 | 47 | 82 | 175 | 72 | 25 | 453 | 87 | 323 | 1183 | 10 |
| RTOR Reduction (vph) | 0 | 2 | 0 | 0 | 10 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 18 | 602 | 0 | 82 | 237 | 0 | 25 | 532 | 0 | 323 | 1193 | 0 |
| Confl. Peds. (#/hr) | 8 | | 32 | 32 | | 8 | 19 | | 21 | 21 | | 19 |
| Heavy Vehicles (%) | 0% | 1% | 5% | 3% | 4% | 4% | 5% | 6% | 2% | 2% | 3% | 0% |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | pm+pt | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | 61.9 | 61.9 | | 61.9 | 61.9 | | 61.7 | 61.7 | | 86.1 | 86.1 | |
| Effective Green, g (s) | 61.9 | 61.9 | | 61.9 | 61.9 | | 61.7 | 61.7 | | 86.1 | 86.1 | |
| Actuated g/C Ratio | 0.39 | 0.39 | | 0.39 | 0.39 | | 0.39 | 0.39 | | 0.54 | 0.54 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 367 | 711 | | 91 | 677 | | 137 | 1257 | | 486 | 1903 | |
| v/s Ratio Prot | | 0.33 | | | 0.14 | | | 0.16 | | c0.09 | 0.34 | |
| v/s Ratio Perm | 0.02 | | | c0.35 | | | 0.07 | | | c0.27 | | |
| v/c Ratio | 0.05 | 0.85 | | 0.90 | 0.35 | | 0.18 | 0.42 | | 0.66 | 0.63 | |
| Uniform Delay, d1 | 30.7 | 44.7 | | 46.2 | 34.8 | | 32.5 | 36.1 | | 22.2 | 25.7 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.1 | 10.1 | | 65.6 | 0.7 | | 2.9 | 1.0 | | 3.4 | 1.6 | |
| Delay (s) | 30.8 | 54.8 | | 111.7 | 35.4 | | 35.4 | 37.1 | | 25.6 | 27.3 | |
| Level of Service | C | D | | F | D | | D | D | | C | C | |
| Approach Delay (s) | | 54.1 | | | 54.5 | | | 37.1 | | | 27.0 | |
| Approach LOS | | D | | | D | | | D | | | C | |

| Intersection Summary | | |
|-----------------------------------|-------|---------------------------|
| HCM 2000 Control Delay | 37.4 | HCM 2000 Level of Service |
| HCM 2000 Volume to Capacity ratio | 0.78 | D |
| Actuated Cycle Length (s) | 160.0 | Sum of lost time (s) |
| Intersection Capacity Utilization | 93.5% | 15.0 |
| Analysis Period (min) | 15 | ICU Level of Service |
| | | F |

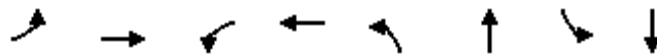
c Critical Lane Group

Timings

<Future>AM

2: Ken Whillans Drive/Private Access & Vodden Street East

03-12-2020



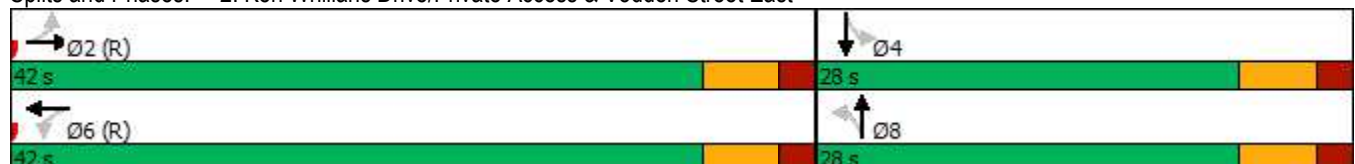
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↗ | → | ↖ | ← | ↖ | ← | | ↕ |
| Traffic Volume (vph) | 39 | 550 | 64 | 374 | 18 | 1 | 11 | 6 |
| Future Volume (vph) | 39 | 550 | 64 | 374 | 18 | 1 | 11 | 6 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 2 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 26.0 | 26.0 | 26.0 | 26.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 42.0 | 42.0 | 42.0 | 42.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (%) | 60.0% | 60.0% | 60.0% | 60.0% | 40.0% | 40.0% | 40.0% | 40.0% |
| 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 57.1 | 57.1 | 57.1 | 57.1 | 8.9 | 8.9 | | 8.9 |
| Actuated g/C Ratio | 0.82 | 0.82 | 0.82 | 0.82 | 0.13 | 0.13 | | 0.13 |
| v/c Ratio | 0.06 | 0.45 | 0.12 | 0.31 | 0.12 | 0.20 | | 0.11 |
| Control Delay | 3.6 | 5.1 | 3.0 | 2.9 | 28.2 | 11.7 | | 16.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | 3.6 | 5.1 | 3.0 | 2.9 | 28.2 | 11.7 | | 16.5 |
| LOS | A | A | A | A | C | B | | B |
| Approach Delay | | 5.0 | | 2.9 | | 16.7 | | 16.5 |
| Approach LOS | | A | | A | | B | | B |

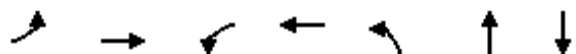
Intersection Summary

Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 19 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.45
 Intersection Signal Delay: 5.2
 Intersection Capacity Utilization 64.6%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 2: Ken Whillans Drive/Private Access & Vodden Street East





| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|-------|-------|------|------|------|
| Lane Group Flow (vph) | 42 | 656 | 70 | 447 | 20 | 46 | 44 |
| v/c Ratio | 0.06 | 0.45 | 0.12 | 0.31 | 0.12 | 0.20 | 0.11 |
| Control Delay | 3.6 | 5.1 | 3.0 | 2.9 | 28.2 | 11.7 | 16.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 3.6 | 5.1 | 3.0 | 2.9 | 28.2 | 11.7 | 16.5 |
| Queue Length 50th (m) | 1.3 | 30.9 | 2.6 | 17.0 | 2.4 | 0.1 | 1.1 |
| Queue Length 95th (m) | 4.2 | 57.1 | 5.8 | 26.7 | 7.8 | 8.0 | 5.2 |
| Internal Link Dist (m) | | 228.5 | | 397.8 | | 93.7 | 45.6 |
| Turn Bay Length (m) | 100.0 | | 100.0 | | 29.0 | | |
| Base Capacity (vph) | 761 | 1474 | 572 | 1462 | 412 | 503 | 913 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.06 | 0.45 | 0.12 | 0.31 | 0.05 | 0.09 | 0.05 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis
 2: Ken Whillans Drive/Private Access & Vodden Street East

<Future>AM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---------------------------|------|-------|------|------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | | ↕ | ↗ |
| Traffic Volume (vph) | 39 | 550 | 53 | 64 | 374 | 37 | 18 | 1 | 41 | 11 | 6 | 23 |
| Future Volume (vph) | 39 | 550 | 53 | 64 | 374 | 37 | 18 | 1 | 41 | 11 | 6 | 23 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 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 | | | 0.95 | |
| Frbp, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.96 | | | 0.99 | |
| Flpb, ped/bikes | 0.98 | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Fr _t | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 0.85 | | | 0.91 | |
| Fl _t Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | | 0.99 | |
| Satd. Flow (prot) | 1755 | 1805 | | 1737 | 1790 | | 1714 | 1505 | | | 3232 | |
| Fl _t Permitted | 0.50 | 1.00 | | 0.38 | 1.00 | | 0.73 | 1.00 | | | 0.87 | |
| Satd. Flow (perm) | 931 | 1805 | | 699 | 1790 | | 1311 | 1505 | | | 2849 | |
| 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 | 598 | 58 | 70 | 407 | 40 | 20 | 1 | 45 | 12 | 7 | 25 |
| RTOR Reduction (vph) | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 41 | 0 | 0 | 23 | 0 |
| Lane Group Flow (vph) | 42 | 653 | 0 | 70 | 444 | 0 | 20 | 5 | 0 | 0 | 21 | 0 |
| Confl. Peds. (#/hr) | 18 | | 12 | 12 | | 18 | 3 | | 11 | 11 | | 3 |
| Heavy Vehicles (%) | 0% | 4% | 2% | 2% | 5% | 0% | 6% | 0% | 5% | 0% | 0% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 8 | | | | 4 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 52.3 | 52.3 | | 52.3 | 52.3 | | 5.7 | 5.7 | | | 5.7 | |
| Effective Green, g (s) | 52.3 | 52.3 | | 52.3 | 52.3 | | 5.7 | 5.7 | | | 5.7 | |
| Actuated g/C Ratio | 0.75 | 0.75 | | 0.75 | 0.75 | | 0.08 | 0.08 | | | 0.08 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | 695 | 1348 | | 522 | 1337 | | 106 | 122 | | | 231 | |
| v/s Ratio Prot | | c0.36 | | | 0.25 | | | 0.00 | | | | |
| v/s Ratio Perm | 0.05 | | | 0.10 | | | c0.02 | | | | 0.01 | |
| v/c Ratio | 0.06 | 0.48 | | 0.13 | 0.33 | | 0.19 | 0.04 | | | 0.09 | |
| Uniform Delay, d1 | 2.3 | 3.5 | | 2.5 | 3.0 | | 30.0 | 29.6 | | | 29.8 | |
| Progression Factor | 1.00 | 1.00 | | 0.82 | 0.76 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | 0.2 | 1.2 | | 0.5 | 0.6 | | 1.8 | 0.3 | | | 0.4 | |
| Delay (s) | 2.5 | 4.8 | | 2.5 | 2.9 | | 31.8 | 29.9 | | | 30.1 | |
| Level of Service | A | A | | A | A | | C | C | | | C | |
| Approach Delay (s) | | 4.6 | | | 2.9 | | | 30.5 | | | 30.1 | |
| Approach LOS | | A | | | A | | | C | | | C | |

Intersection Summary

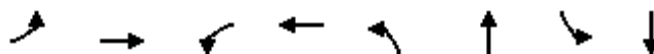
| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 6.1 | HCM 2000 Level of Service | A |
| HCM 2000 Volume to Capacity ratio | 0.46 | | |
| Actuated Cycle Length (s) | 70.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 64.6% | ICU Level of Service | C |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings

3: Centre Street North & Vodden Street East

<Future>AM
03-12-2020



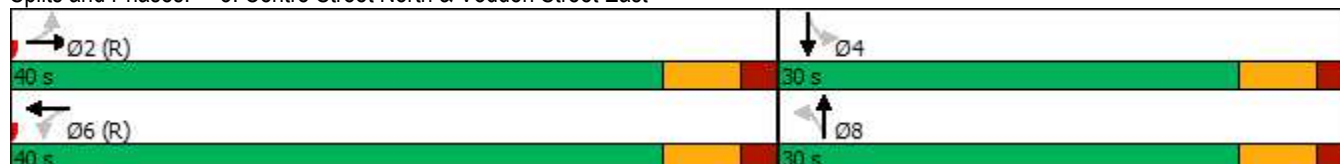
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ |
| Traffic Volume (vph) | 72 | 635 | 78 | 369 | 54 | 116 | 78 | 248 |
| Future Volume (vph) | 72 | 635 | 78 | 369 | 54 | 116 | 78 | 248 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 2 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 28.0 | 28.0 | 28.0 | 28.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| Total Split (s) | 40.0 | 40.0 | 40.0 | 40.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 57.1% | 57.1% | 57.1% | 57.1% | 42.9% | 42.9% | 42.9% | 42.9% |
| 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? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 43.4 | 43.4 | 43.4 | 43.4 | 14.6 | 14.6 | 14.6 | 14.6 |
| Actuated g/C Ratio | 0.62 | 0.62 | 0.62 | 0.62 | 0.21 | 0.21 | 0.21 | 0.21 |
| v/c Ratio | 0.15 | 0.75 | 0.35 | 0.41 | 0.30 | 0.56 | 0.42 | 0.48 |
| Control Delay | 8.5 | 18.3 | 8.6 | 5.8 | 26.0 | 22.6 | 29.3 | 20.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 8.5 | 18.3 | 8.6 | 5.8 | 26.0 | 22.6 | 29.3 | 20.4 |
| LOS | A | B | A | A | C | C | C | C |
| Approach Delay | | 17.4 | | 6.2 | | 23.3 | | 22.0 |
| Approach LOS | | B | | A | | C | | C |

Intersection Summary

Cycle Length: 70
 Actuated Cycle Length: 70
 Offset: 64 (91%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 70
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.75
 Intersection Signal Delay: 16.3
 Intersection Capacity Utilization 88.7%
 Analysis Period (min) 15

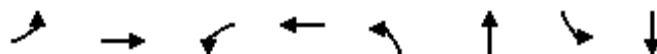
Intersection LOS: B
 ICU Level of Service E

Splits and Phases: 3: Centre Street North & Vodden Street East



Queues
3: Centre Street North & Vodden Street East

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|--------|------|-------|------|-------|------|-------|
| Lane Group Flow (vph) | 78 | 839 | 85 | 461 | 59 | 225 | 85 | 366 |
| v/c Ratio | 0.15 | 0.75 | 0.35 | 0.41 | 0.30 | 0.56 | 0.42 | 0.48 |
| Control Delay | 8.5 | 18.3 | 8.6 | 5.8 | 26.0 | 22.6 | 29.3 | 20.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 8.5 | 18.3 | 8.6 | 5.8 | 26.0 | 22.6 | 29.3 | 20.4 |
| Queue Length 50th (m) | 5.1 | 90.9 | 2.3 | 11.8 | 6.6 | 19.1 | 9.8 | 17.4 |
| Queue Length 95th (m) | 14.5 | #165.7 | 8.6 | 32.5 | 14.5 | 34.1 | 19.6 | 25.5 |
| Internal Link Dist (m) | | 397.8 | | 166.8 | | 100.6 | | 129.3 |
| Turn Bay Length (m) | 47.0 | | 59.5 | | 44.0 | | 35.5 | |
| Base Capacity (vph) | 511 | 1126 | 241 | 1117 | 321 | 625 | 333 | 1219 |
| 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 | 0.15 | 0.75 | 0.35 | 0.41 | 0.18 | 0.36 | 0.26 | 0.30 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

3: Centre Street North & Vodden Street East

<Future>AM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|------|------|------|------|------|-------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | ↖ |
| Traffic Volume (vph) | 72 | 635 | 137 | 78 | 369 | 55 | 54 | 116 | 91 | 78 | 248 | 88 |
| Future Volume (vph) | 72 | 635 | 137 | 78 | 369 | 55 | 54 | 116 | 91 | 78 | 248 | 88 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| 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 | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | |
| Fr _t | 1.00 | 0.97 | | 1.00 | 0.98 | | 1.00 | 0.93 | | 1.00 | 0.96 | |
| Fl _t Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1695 | 1802 | | 1748 | 1792 | | 1745 | 1707 | | 1720 | 3409 | |
| Fl _t Permitted | 0.46 | 1.00 | | 0.21 | 1.00 | | 0.51 | 1.00 | | 0.54 | 1.00 | |
| Satd. Flow (perm) | 823 | 1802 | | 389 | 1792 | | 937 | 1707 | | 972 | 3409 | |
| 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 | 690 | 149 | 85 | 401 | 60 | 59 | 126 | 99 | 85 | 270 | 96 |
| RTOR Reduction (vph) | 0 | 8 | 0 | 0 | 6 | 0 | 0 | 48 | 0 | 0 | 61 | 0 |
| Lane Group Flow (vph) | 78 | 831 | 0 | 85 | 455 | 0 | 59 | 177 | 0 | 85 | 305 | 0 |
| Confl. Peds. (#/hr) | 4 | | 6 | 6 | | 4 | 3 | | 7 | 7 | | 3 |
| Heavy Vehicles (%) | 5% | 3% | 1% | 2% | 3% | 10% | 2% | 5% | 2% | 3% | 3% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 8 | | | 4 | |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 43.4 | 43.4 | | 43.4 | 43.4 | | 14.6 | 14.6 | | 14.6 | 14.6 | |
| Effective Green, g (s) | 43.4 | 43.4 | | 43.4 | 43.4 | | 14.6 | 14.6 | | 14.6 | 14.6 | |
| Actuated g/C Ratio | 0.62 | 0.62 | | 0.62 | 0.62 | | 0.21 | 0.21 | | 0.21 | 0.21 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 510 | 1117 | | 241 | 1111 | | 195 | 356 | | 202 | 711 | |
| v/s Ratio Prot | | c0.46 | | | 0.25 | | | c0.10 | | | 0.09 | |
| v/s Ratio Perm | 0.09 | | | 0.22 | | | 0.06 | | | 0.09 | | |
| v/c Ratio | 0.15 | 0.74 | | 0.35 | 0.41 | | 0.30 | 0.50 | | 0.42 | 0.43 | |
| Uniform Delay, d ₁ | 5.6 | 9.4 | | 6.5 | 6.8 | | 23.4 | 24.5 | | 24.0 | 24.1 | |
| Progression Factor | 1.09 | 1.21 | | 0.57 | 0.64 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d ₂ | 0.6 | 4.4 | | 3.9 | 1.1 | | 1.8 | 2.3 | | 2.9 | 0.9 | |
| Delay (s) | 6.7 | 15.8 | | 7.6 | 5.4 | | 25.2 | 26.7 | | 27.0 | 24.9 | |
| Level of Service | A | B | | A | A | | C | C | | C | C | |
| Approach Delay (s) | | 15.0 | | | 5.8 | | | 26.4 | | | 25.3 | |
| Approach LOS | | B | | | A | | | C | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 16.3 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.68 | | |
| Actuated Cycle Length (s) | 70.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 88.7% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
7: Rutherford Road North & Vodden Street East

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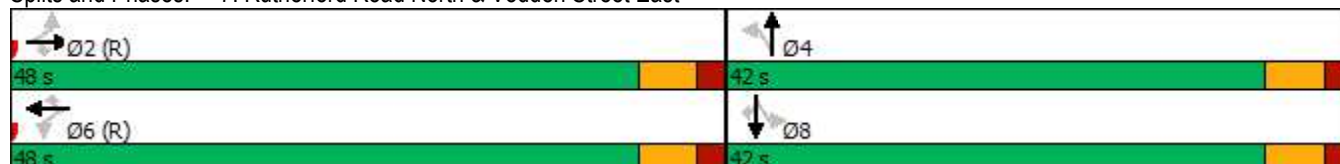


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↖ | ↗ | ↖ | ↖ | ↗ | ↖ | ↗ | ↖ |
| Traffic Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 92 | 406 | 126 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | 8 | | 8 |
| Detector Phase | 2 | 2 | 2 | 6 | 6 | 6 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 42.0 | 42.0 | 42.0 | 42.0 | 42.0 |
| Total Split (%) | 53.3% | 53.3% | 53.3% | 53.3% | 53.3% | 53.3% | 46.7% | 46.7% | 46.7% | 46.7% | 46.7% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 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 | 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 | 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 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 28.5 | 28.5 | 28.5 | 28.5 | 28.5 |
| Actuated g/C Ratio | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 |
| v/c Ratio | 0.26 | 0.46 | 0.23 | 0.17 | 0.36 | 0.09 | 0.50 | 0.36 | 0.29 | 0.72 | 0.24 |
| Control Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| LOS | B | B | A | B | B | A | D | C | C | C | A |
| Approach Delay | | 11.0 | | | 12.8 | | | 25.7 | | 26.4 | |
| Approach LOS | | B | | | B | | | C | | C | |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 17.8
 Intersection Capacity Utilization 80.7%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 7: Rutherford Road North & Vodden Street East



Queues

<Future>AM

7: Rutherford Road North & Vodden Street East

06-01-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|------------------------|-------|-------|------|------|-------|------|------|-------|------|-------|------|
| Lane Group Flow (vph) | 119 | 465 | 202 | 70 | 360 | 72 | 76 | 200 | 96 | 423 | 131 |
| v/c Ratio | 0.26 | 0.46 | 0.23 | 0.17 | 0.36 | 0.09 | 0.50 | 0.36 | 0.29 | 0.72 | 0.24 |
| Control Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| Queue Length 50th (m) | 12.1 | 53.1 | 7.5 | 7.3 | 41.7 | 1.6 | 10.5 | 23.6 | 12.3 | 63.5 | 0.0 |
| Queue Length 95th (m) | m21.8 | 93.8 | 13.9 | 18.9 | 74.6 | 9.2 | 22.2 | 36.2 | 21.8 | 84.0 | 10.2 |
| Internal Link Dist (m) | | 358.4 | | | 418.5 | | | 288.8 | | 340.1 | |
| Turn Bay Length (m) | 50.0 | | 50.0 | 48.5 | | 48.5 | 47.5 | | 41.5 | | 44.5 |
| Base Capacity (vph) | 465 | 1016 | 887 | 411 | 987 | 819 | 190 | 694 | 411 | 744 | 668 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.26 | 0.46 | 0.23 | 0.17 | 0.36 | 0.09 | 0.40 | 0.29 | 0.23 | 0.57 | 0.20 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
7: Rutherford Road North & Vodden Street East

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06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|-------|------|------|------|------|------|------|------|------|-------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 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 | | 1.00 | 1.00 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.93 | 1.00 | 1.00 | 0.91 | 1.00 | 0.98 | | 1.00 | 1.00 | 0.96 |
| Flpb, ped/bikes | 0.96 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 0.99 | 1.00 | | 0.96 | 1.00 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1605 | 1850 | 1449 | 1713 | 1798 | 1431 | 1609 | 1710 | | 1644 | 1861 | 1475 |
| Flt Permitted | 0.50 | 1.00 | 1.00 | 0.41 | 1.00 | 1.00 | 0.28 | 1.00 | | 0.59 | 1.00 | 1.00 |
| Satd. Flow (perm) | 846 | 1850 | 1449 | 748 | 1798 | 1431 | 478 | 1710 | | 1029 | 1861 | 1475 |
| Peak-hour factor, PHF | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 |
| Adj. Flow (vph) | 119 | 465 | 202 | 70 | 360 | 72 | 76 | 158 | 42 | 96 | 423 | 131 |
| RTOR Reduction (vph) | 0 | 0 | 91 | 0 | 0 | 32 | 0 | 12 | 0 | 0 | 0 | 90 |
| Lane Group Flow (vph) | 119 | 465 | 111 | 70 | 360 | 40 | 76 | 188 | 0 | 96 | 423 | 41 |
| Confl. Peds. (#/hr) | 45 | | 31 | 31 | | 45 | 13 | | 37 | 37 | | 13 |
| Heavy Vehicles (%) | 7% | 3% | 3% | 2% | 6% | 2% | 10% | 6% | 5% | 4% | 2% | 4% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 3 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 28.5 | 28.5 | | 28.5 | 28.5 | 28.5 |
| Effective Green, g (s) | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 28.5 | 28.5 | | 28.5 | 28.5 | 28.5 |
| Actuated g/C Ratio | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.32 | 0.32 | | 0.32 | 0.32 | 0.32 |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 465 | 1017 | 796 | 411 | 988 | 787 | 151 | 541 | | 325 | 589 | 467 |
| v/s Ratio Prot | | c0.25 | | | 0.20 | | | 0.11 | | | c0.23 | |
| v/s Ratio Perm | 0.14 | | 0.08 | 0.09 | | 0.03 | 0.16 | | | 0.09 | | 0.03 |
| v/c Ratio | 0.26 | 0.46 | 0.14 | 0.17 | 0.36 | 0.05 | 0.50 | 0.35 | | 0.30 | 0.72 | 0.09 |
| Uniform Delay, d1 | 10.6 | 12.2 | 9.9 | 10.1 | 11.4 | 9.4 | 25.0 | 23.6 | | 23.2 | 27.2 | 21.6 |
| Progression Factor | 0.82 | 0.90 | 1.63 | 0.96 | 1.03 | 1.25 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.1 | 1.2 | 0.3 | 0.8 | 1.0 | 0.1 | 5.4 | 0.8 | | 1.1 | 5.2 | 0.2 |
| Delay (s) | 9.8 | 12.2 | 16.4 | 10.5 | 12.7 | 11.9 | 30.4 | 24.4 | | 24.2 | 32.4 | 21.8 |
| Level of Service | A | B | B | B | B | B | C | C | | C | C | C |
| Approach Delay (s) | | 12.9 | | | 12.3 | | | 26.1 | | | 29.0 | |
| Approach LOS | | B | | | B | | | C | | | C | |

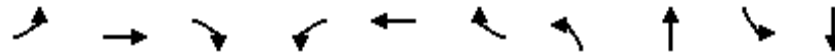
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 19.1 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.55 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 80.7% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
5: Kennedy Road North & Vodden Street East

<Future>AM
03-12-2020

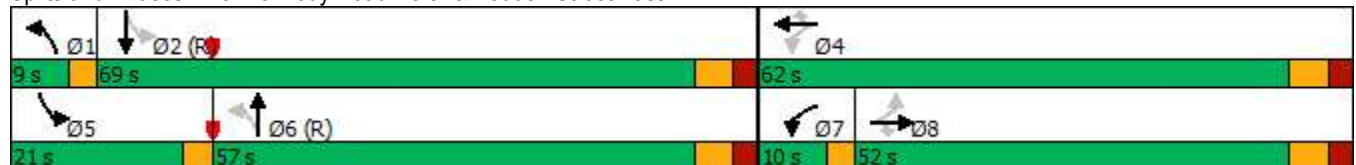


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↑ | ↗ | ↖ | ↑ | ↗ | ↖ | ↑↔ | ↖ | ↑↔ |
| Traffic Volume (vph) | 39 | 444 | 99 | 131 | 334 | 74 | 74 | 398 | 233 | 1081 |
| Future Volume (vph) | 39 | 444 | 99 | 131 | 334 | 74 | 74 | 398 | 233 | 1081 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | pm+pt | NA |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | 5 | 2 |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | 2 | |
| Detector Phase | 8 | 8 | 8 | 7 | 4 | 4 | 1 | 6 | 5 | 2 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 5.0 | 8.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 |
| Minimum Split (s) | 40.8 | 40.8 | 40.8 | 8.0 | 40.8 | 40.8 | 8.0 | 39.7 | 8.0 | 39.7 |
| Total Split (s) | 52.0 | 52.0 | 52.0 | 10.0 | 62.0 | 62.0 | 9.0 | 57.0 | 21.0 | 69.0 |
| Total Split (%) | 37.1% | 37.1% | 37.1% | 7.1% | 44.3% | 44.3% | 6.4% | 40.7% | 15.0% | 49.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 2.8 | 0.0 | 2.8 | 2.8 | 0.0 | 2.7 | 0.0 | 2.7 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.7 | 3.0 | 6.7 |
| Lead/Lag | Lag | Lag | Lag | Lead | | | Lead | Lag | Lead | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | | | Yes | Yes | Yes | Yes |
| Recall Mode | None | None | None | None | None | None | None | C-Max | None | C-Max |
| Act Effct Green (s) | 41.3 | 41.3 | 41.3 | 55.1 | 51.3 | 51.3 | 66.7 | 57.0 | 78.9 | 66.2 |
| Actuated g/C Ratio | 0.30 | 0.30 | 0.30 | 0.39 | 0.37 | 0.37 | 0.48 | 0.41 | 0.56 | 0.47 |
| v/c Ratio | 0.16 | 0.87 | 0.22 | 0.80 | 0.53 | 0.14 | 0.48 | 0.39 | 0.51 | 0.77 |
| Control Delay | 37.8 | 62.4 | 10.6 | 61.8 | 37.4 | 6.7 | 26.6 | 30.3 | 20.4 | 35.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 37.8 | 62.4 | 10.6 | 61.8 | 37.4 | 6.7 | 26.6 | 30.3 | 20.4 | 35.4 |
| LOS | D | E | B | E | D | A | C | C | C | D |
| Approach Delay | | 52.0 | | | 39.0 | | | 29.8 | | 32.8 |
| Approach LOS | | D | | | D | | | C | | C |

Intersection Summary

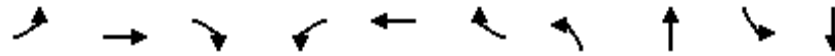
Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 133 (95%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 37.0
 Intersection LOS: D
 Intersection Capacity Utilization 92.2%
 ICU Level of Service F
 Analysis Period (min) 15

Splits and Phases: 5: Kennedy Road North & Vodden Street East



Queues
5: Kennedy Road North & Vodden Street East

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|-------|-------|------|-------|-------|------|------|-------|------|-------|
| Lane Group Flow (vph) | 41 | 472 | 105 | 139 | 355 | 79 | 79 | 519 | 248 | 1228 |
| v/c Ratio | 0.16 | 0.87 | 0.22 | 0.80 | 0.53 | 0.14 | 0.48 | 0.39 | 0.51 | 0.77 |
| Control Delay | 37.8 | 62.4 | 10.6 | 61.8 | 37.4 | 6.7 | 26.6 | 30.3 | 20.4 | 35.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 37.8 | 62.4 | 10.6 | 61.8 | 37.4 | 6.7 | 26.6 | 30.3 | 20.4 | 35.4 |
| Queue Length 50th (m) | 7.8 | 115.6 | 3.1 | 24.4 | 74.3 | 0.5 | 10.1 | 52.9 | 35.4 | 150.7 |
| Queue Length 95th (m) | m18.7 | 154.5 | 17.0 | #48.6 | 102.2 | 10.8 | 18.8 | 71.2 | 53.0 | 182.8 |
| Internal Link Dist (m) | | 488.5 | | | 191.2 | | | 129.6 | | 496.7 |
| Turn Bay Length (m) | 52.0 | | 52.0 | 43.5 | | 43.5 | 58.0 | | 79.5 | |
| Base Capacity (vph) | 285 | 596 | 524 | 173 | 728 | 587 | 163 | 1330 | 509 | 1594 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.14 | 0.79 | 0.20 | 0.80 | 0.49 | 0.13 | 0.48 | 0.39 | 0.49 | 0.77 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

5: Kennedy Road North & Vodden Street East

<Future>AM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|-------|------|------|-------|------|------|-------|-------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 39 | 444 | 99 | 131 | 334 | 74 | 74 | 398 | 90 | 233 | 1081 | 73 |
| Future Volume (vph) | 39 | 444 | 99 | 131 | 334 | 74 | 74 | 398 | 90 | 233 | 1081 | 73 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 1.00 | 0.97 | 1.00 | 1.00 | 0.95 | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 0.98 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 0.99 | 1.00 | |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.97 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1743 | 1847 | 1417 | 1699 | 1847 | 1374 | 1637 | 3237 | | 1705 | 3366 | |
| Flt Permitted | 0.48 | 1.00 | 1.00 | 0.14 | 1.00 | 1.00 | 0.13 | 1.00 | | 0.37 | 1.00 | |
| Satd. Flow (perm) | 885 | 1847 | 1417 | 259 | 1847 | 1374 | 218 | 3237 | | 672 | 3366 | |
| Peak-hour factor, PHF | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Adj. Flow (vph) | 41 | 472 | 105 | 139 | 355 | 79 | 79 | 423 | 96 | 248 | 1150 | 78 |
| RTOR Reduction (vph) | 0 | 0 | 70 | 0 | 0 | 48 | 0 | 13 | 0 | 0 | 3 | 0 |
| Lane Group Flow (vph) | 41 | 472 | 35 | 139 | 355 | 31 | 79 | 506 | 0 | 248 | 1225 | 0 |
| Confl. Peds. (#/hr) | 34 | | 17 | 17 | | 34 | 31 | | 23 | 23 | | 31 |
| Confl. Bikes (#/hr) | | | | | | 1 | | | | | | |
| Heavy Vehicles (%) | 0% | 4% | 9% | 5% | 4% | 10% | 9% | 9% | 5% | 4% | 5% | 7% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | | pm+pt | NA | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | 5 | 2 | |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | | 2 | | |
| Actuated Green, G (s) | 41.3 | 41.3 | 41.3 | 51.3 | 51.3 | 51.3 | 63.0 | 57.0 | | 75.2 | 66.2 | |
| Effective Green, g (s) | 41.3 | 41.3 | 41.3 | 51.3 | 51.3 | 51.3 | 63.0 | 57.0 | | 75.2 | 66.2 | |
| Actuated g/C Ratio | 0.29 | 0.29 | 0.29 | 0.37 | 0.37 | 0.37 | 0.45 | 0.41 | | 0.54 | 0.47 | |
| Clearance Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 3.0 | 5.0 | 5.0 | 3.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 261 | 544 | 418 | 166 | 676 | 503 | 158 | 1317 | | 473 | 1591 | |
| v/s Ratio Prot | | 0.26 | | c0.04 | 0.19 | | 0.02 | 0.16 | | c0.06 | c0.36 | |
| v/s Ratio Perm | 0.05 | | 0.02 | c0.26 | | 0.02 | 0.20 | | | 0.22 | | |
| v/c Ratio | 0.16 | 0.87 | 0.08 | 0.84 | 0.53 | 0.06 | 0.50 | 0.38 | | 0.52 | 0.77 | |
| Uniform Delay, d1 | 36.5 | 46.8 | 35.7 | 37.5 | 34.8 | 28.7 | 25.1 | 29.2 | | 18.2 | 30.6 | |
| Progression Factor | 1.04 | 1.01 | 1.36 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.5 | 13.4 | 0.2 | 29.1 | 1.4 | 0.1 | 2.5 | 0.9 | | 1.1 | 3.7 | |
| Delay (s) | 38.6 | 60.8 | 48.7 | 66.6 | 36.2 | 28.9 | 27.6 | 30.0 | | 19.2 | 34.2 | |
| Level of Service | D | E | D | E | D | C | C | C | | B | C | |
| Approach Delay (s) | | 57.3 | | | 42.6 | | | 29.7 | | | 31.7 | |
| Approach LOS | | E | | | D | | | C | | | C | |

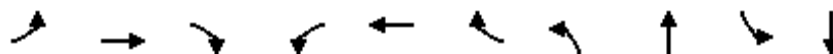
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 38.1 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 0.80 | | |
| Actuated Cycle Length (s) | 140.0 | Sum of lost time (s) | 19.5 |
| Intersection Capacity Utilization | 92.2% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
6: Hansen Road North & Vodden Street East

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | | | | | | |
| Traffic Volume (vph) | 27 | 746 | 172 | 65 | 484 | 27 | 56 | 47 | 94 | 118 |
| Future Volume (vph) | 27 | 746 | 172 | 65 | 484 | 27 | 56 | 47 | 94 | 118 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | | 2 | | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | 2 | | 2 | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 55.0 | 55.0 | 55.0 | 55.0 | 55.0 | 55.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (%) | 61.1% | 61.1% | 61.1% | 61.1% | 61.1% | 61.1% | 38.9% | 38.9% | 38.9% | 38.9% |
| Yellow Time (s) | 4.0 | 4.0 | 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 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 61.4 | 61.4 | 61.4 | 61.4 | 61.4 | 61.4 | 16.6 | 16.6 | 16.6 | 16.6 |
| Actuated g/C Ratio | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.18 | 0.18 | 0.18 | 0.18 |
| v/c Ratio | 0.05 | 0.63 | 0.18 | 0.23 | 0.41 | 0.03 | 0.34 | 0.31 | 0.45 | 0.54 |
| Control Delay | 6.6 | 12.0 | 3.6 | 3.6 | 3.1 | 0.1 | 35.0 | 17.3 | 37.4 | 33.2 |
| Queue Delay | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 6.6 | 12.3 | 3.6 | 3.6 | 3.1 | 0.1 | 35.0 | 17.3 | 37.4 | 33.2 |
| LOS | A | B | A | A | A | A | D | B | D | C |
| Approach Delay | | 10.6 | | | 3.1 | | | 23.6 | | 34.7 |
| Approach LOS | | B | | | A | | | C | | C |

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 37 (41%), Referenced to phase 2:EBWB, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 12.7

Intersection LOS: B

Intersection Capacity Utilization 86.8%

ICU Level of Service E

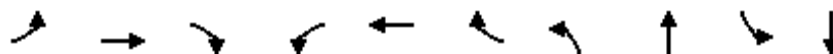
Analysis Period (min) 15

Splits and Phases: 6: Hansen Road North & Vodden Street East



Queues
6: Hansen Road North & Vodden Street East

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|------|-------|------|------|-------|------|------|------|------|------|
| Lane Group Flow (vph) | 29 | 811 | 187 | 71 | 526 | 29 | 61 | 110 | 102 | 187 |
| v/c Ratio | 0.05 | 0.63 | 0.18 | 0.23 | 0.41 | 0.03 | 0.34 | 0.31 | 0.45 | 0.54 |
| Control Delay | 6.6 | 12.0 | 3.6 | 3.6 | 3.1 | 0.1 | 35.0 | 17.3 | 37.4 | 33.2 |
| Queue Delay | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 6.6 | 12.3 | 3.6 | 3.6 | 3.1 | 0.1 | 35.0 | 17.3 | 37.4 | 33.2 |
| Queue Length 50th (m) | 1.4 | 67.7 | 4.4 | 1.2 | 9.3 | 0.0 | 9.3 | 7.5 | 15.9 | 25.2 |
| Queue Length 95th (m) | 5.3 | 132.4 | 14.1 | m2.1 | m18.0 | m0.0 | 18.8 | 19.2 | 27.9 | 40.9 |
| Internal Link Dist (m) | | 191.2 | | | 358.4 | | | 69.3 | | 49.9 |
| Turn Bay Length (m) | 28.0 | | 30.0 | 43.0 | | 30.0 | 34.5 | | 24.0 | |
| Base Capacity (vph) | 535 | 1284 | 1059 | 315 | 1274 | 961 | 318 | 569 | 398 | 582 |
| Starvation Cap Reductn | 0 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.05 | 0.70 | 0.18 | 0.23 | 0.41 | 0.03 | 0.19 | 0.19 | 0.26 | 0.32 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
6: Hansen Road North & Vodden Street East

<Future>AM
03-12-2020

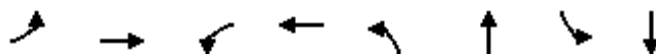


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|------|------|------|-------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 27 | 746 | 172 | 65 | 484 | 27 | 56 | 47 | 54 | 94 | 118 | 54 |
| Future Volume (vph) | 27 | 746 | 172 | 65 | 484 | 27 | 56 | 47 | 54 | 94 | 118 | 54 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 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 | | 1.00 | 1.00 | |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.96 | 1.00 | 1.00 | 0.94 | 1.00 | 0.98 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 0.98 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.99 | 1.00 | | 0.99 | 1.00 | |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.92 | | 1.00 | 0.95 | |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1755 | 1883 | 1506 | 1709 | 1868 | 1393 | 1728 | 1643 | | 1714 | 1751 | |
| Flt Permitted | 0.42 | 1.00 | 1.00 | 0.26 | 1.00 | 1.00 | 0.54 | 1.00 | | 0.69 | 1.00 | |
| Satd. Flow (perm) | 784 | 1883 | 1506 | 463 | 1868 | 1393 | 988 | 1643 | | 1238 | 1751 | |
| 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) | 29 | 811 | 187 | 71 | 526 | 29 | 61 | 51 | 59 | 102 | 128 | 59 |
| RTOR Reduction (vph) | 0 | 0 | 32 | 0 | 0 | 9 | 0 | 48 | 0 | 0 | 22 | 0 |
| Lane Group Flow (vph) | 29 | 811 | 155 | 71 | 526 | 20 | 61 | 62 | 0 | 102 | 165 | 0 |
| Confl. Peds. (#/hr) | 25 | | 12 | 12 | | 25 | 11 | | 8 | 8 | | 11 |
| Heavy Vehicles (%) | 0% | 2% | 2% | 4% | 2% | 8% | 2% | 3% | 8% | 3% | 3% | 4% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | 2 | 2 | | 2 | 4 | | | 4 | | |
| Actuated Green, G (s) | 61.4 | 61.4 | 61.4 | 61.4 | 61.4 | 61.4 | 16.6 | 16.6 | | 16.6 | 16.6 | |
| Effective Green, g (s) | 61.4 | 61.4 | 61.4 | 61.4 | 61.4 | 61.4 | 16.6 | 16.6 | | 16.6 | 16.6 | |
| Actuated g/C Ratio | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.18 | 0.18 | | 0.18 | 0.18 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 534 | 1284 | 1027 | 315 | 1274 | 950 | 182 | 303 | | 228 | 322 | |
| v/s Ratio Prot | | c0.43 | | | 0.28 | | | 0.04 | | | c0.09 | |
| v/s Ratio Perm | 0.04 | | 0.10 | 0.15 | | 0.01 | 0.06 | | | 0.08 | | |
| v/c Ratio | 0.05 | 0.63 | 0.15 | 0.23 | 0.41 | 0.02 | 0.34 | 0.20 | | 0.45 | 0.51 | |
| Uniform Delay, d1 | 4.7 | 8.0 | 5.1 | 5.4 | 6.3 | 4.6 | 31.9 | 31.1 | | 32.6 | 33.1 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 0.31 | 0.32 | 0.02 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.2 | 2.4 | 0.3 | 1.3 | 0.8 | 0.0 | 2.3 | 0.7 | | 2.9 | 2.7 | |
| Delay (s) | 4.9 | 10.4 | 5.4 | 3.0 | 2.8 | 0.1 | 34.2 | 31.8 | | 35.5 | 35.8 | |
| Level of Service | A | B | A | A | A | A | C | C | | D | D | |
| Approach Delay (s) | | 9.3 | | | 2.7 | | | 32.7 | | | 35.7 | |
| Approach LOS | | A | | | A | | | C | | | D | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 12.8 | | | | HCM 2000 Level of Service | | | | B | |
| HCM 2000 Volume to Capacity ratio | | | 0.61 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | Sum of lost time (s) | | | | 12.0 | |
| Intersection Capacity Utilization | | | 86.8% | | | | ICU Level of Service | | | | E | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
8: Archdekin Drive & Vodden Street East

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↗ | | ↕ | | ↕ |
| Traffic Volume (vph) | 30 | 524 | 59 | 399 | 35 | 20 | 89 | 36 |
| Future Volume (vph) | 30 | 524 | 59 | 399 | 35 | 20 | 89 | 36 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 2 | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 23.0 | 23.0 | 23.0 | 23.0 | 31.0 | 31.0 | 31.0 | 31.0 |
| Total Split (s) | 58.0 | 58.0 | 58.0 | 58.0 | 32.0 | 32.0 | 32.0 | 32.0 |
| Total Split (%) | 64.4% | 64.4% | 64.4% | 64.4% | 35.6% | 35.6% | 35.6% | 35.6% |
| 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 59.9 | 59.9 | 59.9 | 59.9 | | 18.1 | | 18.1 |
| Actuated g/C Ratio | 0.67 | 0.67 | 0.67 | 0.67 | | 0.20 | | 0.20 |
| v/c Ratio | 0.06 | 0.49 | 0.14 | 0.38 | | 0.37 | | 0.64 |
| Control Delay | 5.4 | 6.9 | 8.1 | 8.7 | | 18.6 | | 38.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 |
| Total Delay | 5.4 | 6.9 | 8.1 | 8.7 | | 18.6 | | 38.5 |
| LOS | A | A | A | A | | B | | D |
| Approach Delay | | 6.8 | | 8.6 | | 18.6 | | 38.5 |
| Approach LOS | | A | | A | | B | | D |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 33 (37%), Referenced to phase 2:EBWB, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.64
 Intersection Signal Delay: 12.5
 Intersection Capacity Utilization 69.6%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 8: Archdekin Drive & Vodden Street East



Queues
8: Archdekin Drive & Vodden Street East

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBT | SBT |
|------------------------|-------|-------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 33 | 592 | 64 | 463 | 126 | 185 |
| v/c Ratio | 0.06 | 0.49 | 0.14 | 0.38 | 0.37 | 0.64 |
| Control Delay | 5.4 | 6.9 | 8.1 | 8.7 | 18.6 | 38.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 5.4 | 6.9 | 8.1 | 8.7 | 18.6 | 38.5 |
| Queue Length 50th (m) | 1.4 | 31.3 | 3.6 | 30.9 | 9.4 | 26.3 |
| Queue Length 95th (m) | m1.9 | m33.6 | 10.9 | 61.4 | 21.9 | 42.8 |
| Internal Link Dist (m) | | 418.5 | | 579.8 | 115.4 | 151.2 |
| Turn Bay Length (m) | 100.0 | | 100.0 | | | |
| Base Capacity (vph) | 543 | 1220 | 452 | 1217 | 460 | 408 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.06 | 0.49 | 0.14 | 0.38 | 0.27 | 0.45 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

8: Archdekin Drive & Vodden Street East

<Future>AM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | |
|-----------------------------------|------|-------|-------|------|------|------|------|------|------|------|-------|---------------------------|------|
| Lane Configurations | | | | | | | | | | | | | |
| Traffic Volume (vph) | 30 | 524 | 20 | 59 | 399 | 27 | 35 | 20 | 61 | 89 | 36 | 45 | |
| Future Volume (vph) | 30 | 524 | 20 | 59 | 399 | 27 | 35 | 20 | 61 | 89 | 36 | 45 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | |
| Total Lost time (s) | 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 | | |
| Frbp, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | | 0.98 | | | 0.98 | | |
| Flpb, ped/bikes | 0.98 | 1.00 | | 1.00 | 1.00 | | | 0.99 | | | 0.99 | | |
| Frt | 1.00 | 0.99 | | 1.00 | 0.99 | | | 0.93 | | | 0.96 | | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | | 0.99 | | | 0.97 | | |
| Satd. Flow (prot) | 1685 | 1832 | | 1710 | 1825 | | | 1661 | | | 1721 | | |
| Flt Permitted | 0.46 | 1.00 | | 0.38 | 1.00 | | | 0.85 | | | 0.77 | | |
| Satd. Flow (perm) | 816 | 1832 | | 678 | 1825 | | | 1441 | | | 1366 | | |
| 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) | 33 | 570 | 22 | 64 | 434 | 29 | 38 | 22 | 66 | 97 | 39 | 49 | |
| RTOR Reduction (vph) | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 50 | 0 | 0 | 16 | 0 | |
| Lane Group Flow (vph) | 33 | 591 | 0 | 64 | 461 | 0 | 0 | 76 | 0 | 0 | 169 | 0 | |
| Confl. Peds. (#/hr) | 15 | | 4 | 4 | | 15 | 25 | | 12 | 12 | | 25 | |
| Heavy Vehicles (%) | 4% | 3% | 0% | 4% | 3% | 4% | 6% | 5% | 0% | 3% | 3% | 0% | |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | | |
| Actuated Green, G (s) | 59.9 | 59.9 | | 59.9 | 59.9 | | | 18.1 | | | 18.1 | | |
| Effective Green, g (s) | 59.9 | 59.9 | | 59.9 | 59.9 | | | 18.1 | | | 18.1 | | |
| Actuated g/C Ratio | 0.67 | 0.67 | | 0.67 | 0.67 | | | 0.20 | | | 0.20 | | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | | | 6.0 | | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | | | 5.0 | | |
| Lane Grp Cap (vph) | 543 | 1219 | | 451 | 1214 | | | 289 | | | 274 | | |
| v/s Ratio Prot | | c0.32 | | | 0.25 | | | | | | | | |
| v/s Ratio Perm | 0.04 | | | 0.09 | | | | 0.05 | | | c0.12 | | |
| v/c Ratio | 0.06 | 0.48 | | 0.14 | 0.38 | | | 0.26 | | | 0.62 | | |
| Uniform Delay, d1 | 5.2 | 7.4 | | 5.6 | 6.7 | | | 30.3 | | | 32.8 | | |
| Progression Factor | 0.77 | 0.77 | | 1.00 | 1.00 | | | 1.00 | | | 1.00 | | |
| Incremental Delay, d2 | 0.0 | 0.1 | | 0.7 | 0.9 | | | 1.0 | | | 5.9 | | |
| Delay (s) | 4.1 | 5.9 | | 6.2 | 7.6 | | | 31.4 | | | 38.6 | | |
| Level of Service | A | A | | A | A | | | C | | | D | | |
| Approach Delay (s) | | 5.8 | | | 7.5 | | | 31.4 | | | 38.6 | | |
| Approach LOS | | A | | | A | | | C | | | D | | |
| Intersection Summary | | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 12.7 | | | | | | | | | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | | | 0.51 | | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | | | | | | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | | | 69.6% | | | | | | | | | ICU Level of Service | C |
| Analysis Period (min) | | | 15 | | | | | | | | | | |

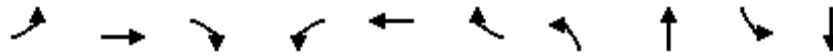
c Critical Lane Group

Timings

<Future>AM

9: Laurelcrest Street/Leeward Drive & Vodden Street East

03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↑ | ↗ | ↖ | ↑ | ↗ | ↖ | ↑ | ↗ | ↖ |
| Traffic Volume (vph) | 2 | 454 | 281 | 294 | 342 | 17 | 62 | 2 | 8 | 34 |
| Future Volume (vph) | 2 | 454 | 281 | 294 | 342 | 17 | 62 | 2 | 8 | 34 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 1 | 6 | | | 4 | | 8 |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | 8 | |
| Detector Phase | 2 | 2 | 2 | 1 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 5.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 27.0 | 27.0 | 27.0 | 9.5 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 50.0 | 50.0 | 50.0 | 23.0 | 73.0 | 73.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (%) | 50.0% | 50.0% | 50.0% | 23.0% | 73.0% | 73.0% | 27.0% | 27.0% | 27.0% | 27.0% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 3.5 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 1.0 | 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 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 4.5 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lag | Lag | Lag | Lead | | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | None | Max | Max | Max | Max | Max | Max |
| Act Effct Green (s) | 50.0 | 50.0 | 50.0 | 68.5 | 67.0 | 67.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Actuated g/C Ratio | 0.50 | 0.50 | 0.50 | 0.68 | 0.67 | 0.67 | 0.21 | 0.21 | 0.21 | 0.21 |
| v/c Ratio | 0.00 | 0.54 | 0.36 | 0.56 | 0.30 | 0.02 | 0.25 | 0.21 | 0.04 | 0.11 |
| Control Delay | 14.0 | 20.5 | 7.0 | 10.2 | 7.6 | 1.0 | 36.0 | 9.8 | 32.1 | 28.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 14.0 | 20.5 | 7.0 | 10.2 | 7.6 | 1.0 | 36.0 | 9.8 | 32.1 | 28.4 |
| LOS | B | C | A | B | A | A | D | A | C | C |
| Approach Delay | | 15.3 | | | 8.6 | | | 22.1 | | 29.1 |
| Approach LOS | | B | | | A | | | C | | C |

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 13.5

Intersection LOS: B

Intersection Capacity Utilization 71.4%

ICU Level of Service C

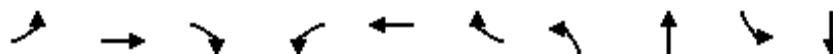
Analysis Period (min) 15

Splits and Phases: 9: Laurelcrest Street/Leeward Drive & Vodden Street East



9: Laurelcrest Street/Leeward Drive & Vodden Street East

03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|------|-------|------|------|-------|------|------|------|------|-------|
| Lane Group Flow (vph) | 2 | 493 | 305 | 320 | 372 | 18 | 67 | 76 | 9 | 45 |
| v/c Ratio | 0.00 | 0.54 | 0.36 | 0.56 | 0.30 | 0.02 | 0.25 | 0.21 | 0.04 | 0.11 |
| Control Delay | 14.0 | 20.5 | 7.0 | 10.2 | 7.6 | 1.0 | 36.0 | 9.8 | 32.1 | 28.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 14.0 | 20.5 | 7.0 | 10.2 | 7.6 | 1.0 | 36.0 | 9.8 | 32.1 | 28.4 |
| Queue Length 50th (m) | 0.2 | 62.4 | 10.8 | 21.0 | 26.6 | 0.0 | 10.9 | 0.3 | 1.4 | 5.8 |
| Queue Length 95th (m) | 1.4 | 99.7 | 29.3 | 32.1 | 39.8 | 1.2 | 22.9 | 11.7 | 5.6 | 14.9 |
| Internal Link Dist (m) | | 266.2 | | | 256.7 | | | 92.3 | | 301.6 |
| Turn Bay Length (m) | 36.0 | | 30.0 | 42.5 | | 30.0 | 43.0 | | 22.0 | |
| Base Capacity (vph) | 506 | 915 | 853 | 637 | 1237 | 942 | 264 | 369 | 245 | 396 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.00 | 0.54 | 0.36 | 0.50 | 0.30 | 0.02 | 0.25 | 0.21 | 0.04 | 0.11 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis
 9: Laurelcrest Street/Leeward Drive & Vodden Street East

<Future>AM
 03-12-2020



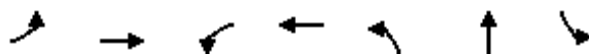
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|-------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ |
| Traffic Volume (vph) | 2 | 454 | 281 | 294 | 342 | 17 | 62 | 2 | 68 | 8 | 34 | 7 |
| Future Volume (vph) | 2 | 454 | 281 | 294 | 342 | 17 | 62 | 2 | 68 | 8 | 34 | 7 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 4.5 | 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 | | 1.00 | 1.00 | |
| Frbp, ped/bikes | 1.00 | 1.00 | 0.96 | 1.00 | 1.00 | 0.98 | 1.00 | 0.97 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.99 | 1.00 | | 0.99 | 1.00 | |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.85 | | 1.00 | 0.97 | |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1780 | 1830 | 1509 | 1782 | 1847 | 1391 | 1646 | 1479 | | 1566 | 1859 | |
| Flt Permitted | 0.54 | 1.00 | 1.00 | 0.33 | 1.00 | 1.00 | 0.73 | 1.00 | | 0.71 | 1.00 | |
| Satd. Flow (perm) | 1012 | 1830 | 1509 | 618 | 1847 | 1391 | 1261 | 1479 | | 1166 | 1859 | |
| 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) | 2 | 493 | 305 | 320 | 372 | 18 | 67 | 2 | 74 | 9 | 37 | 8 |
| RTOR Reduction (vph) | 0 | 0 | 99 | 0 | 0 | 6 | 0 | 58 | 0 | 0 | 6 | 0 |
| Lane Group Flow (vph) | 2 | 493 | 207 | 320 | 372 | 12 | 67 | 18 | 0 | 9 | 39 | 0 |
| Confl. Peds. (#/hr) | 2 | | 7 | 7 | | 2 | 6 | | 4 | 4 | | 6 |
| Heavy Vehicles (%) | 0% | 5% | 2% | 0% | 4% | 12% | 7% | 0% | 8% | 13% | 0% | 0% |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | 1 | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | | 8 | | |
| Actuated Green, G (s) | 50.0 | 50.0 | 50.0 | 67.0 | 67.0 | 67.0 | 21.0 | 21.0 | | 21.0 | 21.0 | |
| Effective Green, g (s) | 50.0 | 50.0 | 50.0 | 67.0 | 67.0 | 67.0 | 21.0 | 21.0 | | 21.0 | 21.0 | |
| Actuated g/C Ratio | 0.50 | 0.50 | 0.50 | 0.67 | 0.67 | 0.67 | 0.21 | 0.21 | | 0.21 | 0.21 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 4.5 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 506 | 915 | 754 | 559 | 1237 | 931 | 264 | 310 | | 244 | 390 | |
| v/s Ratio Prot | | 0.27 | | c0.07 | 0.20 | | | 0.01 | | | 0.02 | |
| v/s Ratio Perm | 0.00 | | 0.14 | c0.31 | | 0.01 | c0.05 | | | 0.01 | | |
| v/c Ratio | 0.00 | 0.54 | 0.27 | 0.57 | 0.30 | 0.01 | 0.25 | 0.06 | | 0.04 | 0.10 | |
| Uniform Delay, d1 | 12.5 | 17.1 | 14.5 | 9.0 | 6.8 | 5.5 | 33.0 | 31.6 | | 31.4 | 31.9 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.0 | 2.3 | 0.9 | 1.4 | 0.6 | 0.0 | 2.3 | 0.3 | | 0.3 | 0.5 | |
| Delay (s) | 12.5 | 19.4 | 15.4 | 10.4 | 7.4 | 5.5 | 35.3 | 31.9 | | 31.7 | 32.4 | |
| Level of Service | B | B | B | B | A | A | D | C | | C | C | |
| Approach Delay (s) | | 17.8 | | | 8.7 | | | 33.5 | | | 32.3 | |
| Approach LOS | | B | | | A | | | C | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 15.8 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.51 | | |
| Actuated Cycle Length (s) | 100.0 | Sum of lost time (s) | 16.5 |
| Intersection Capacity Utilization | 71.4% | ICU Level of Service | C |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

Timings
10: Vodden Street East & Howden Blvd

<Future>AM
03-12-2020

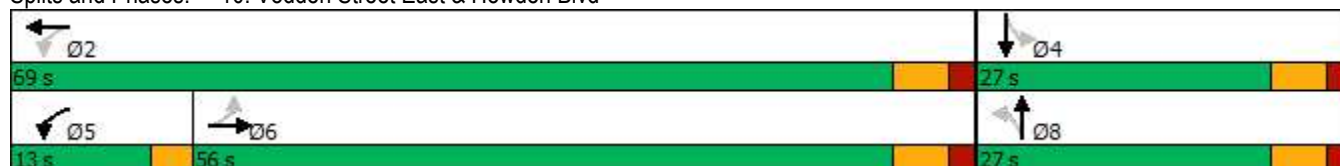


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL |
|----------------------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ |
| Traffic Volume (vph) | 2 | 307 | 188 | 123 | 170 | 5 | 1 |
| Future Volume (vph) | 2 | 307 | 188 | 123 | 170 | 5 | 1 |
| Turn Type | Perm | NA | pm+pt | NA | Perm | NA | Perm |
| Protected Phases | | 6 | 5 | 2 | | 8 | |
| Permitted Phases | 6 | | 2 | | 8 | | 4 |
| Detector Phase | 6 | 6 | 5 | 2 | 8 | 8 | 4 |
| Switch Phase | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 24.0 | 24.0 | 9.0 | 24.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 56.0 | 56.0 | 13.0 | 69.0 | 27.0 | 27.0 | 27.0 |
| Total Split (%) | 58.3% | 58.3% | 13.5% | 71.9% | 28.1% | 28.1% | 28.1% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 0.0 | 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lag | Lag | Lead | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | | | | |
| Recall Mode | Max | Max | None | Max | None | None | None |
| Act Effct Green (s) | 51.5 | 51.5 | 66.1 | 63.1 | 17.3 | 17.3 | 17.3 |
| Actuated g/C Ratio | 0.56 | 0.56 | 0.72 | 0.68 | 0.19 | 0.19 | 0.19 |
| v/c Ratio | 0.00 | 0.70 | 0.44 | 0.10 | 0.66 | 0.57 | 0.01 |
| Control Delay | 11.0 | 18.2 | 8.0 | 5.8 | 47.3 | 8.6 | 30.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.0 | 18.2 | 8.0 | 5.8 | 47.3 | 8.6 | 30.0 |
| LOS | B | B | A | A | D | A | C |
| Approach Delay | | 18.2 | | 7.1 | | 22.2 | |
| Approach LOS | | B | | A | | C | |

Intersection Summary

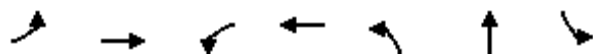
Cycle Length: 96
 Actuated Cycle Length: 92.4
 Natural Cycle: 70
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.70
 Intersection Signal Delay: 17.2
 Intersection LOS: B
 Intersection Capacity Utilization 82.6%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 10: Vodden Street East & Howden Blvd



Queues
10: Vodden Street East & Howden Blvd

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL |
|-----------------------------|------|-------|------|-------|-------|-------|------|
| Lane Group Flow (vph) | 2 | 680 | 188 | 123 | 170 | 312 | 1 |
| v/c Ratio | 0.00 | 0.70 | 0.44 | 0.10 | 0.66 | 0.57 | 0.01 |
| Control Delay | 11.0 | 18.2 | 8.0 | 5.8 | 47.3 | 8.6 | 30.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.0 | 18.2 | 8.0 | 5.8 | 47.3 | 8.6 | 30.0 |
| Queue Length 50th (m) | 0.2 | 72.9 | 9.5 | 6.8 | 28.2 | 0.7 | 0.2 |
| Queue Length 95th (m) | 1.2 | 126.9 | 18.0 | 13.7 | 49.1 | 21.6 | 1.5 |
| Internal Link Dist (m) | | 397.6 | | 661.5 | | 256.7 | |
| Turn Bay Length (m) | 6.0 | | 25.5 | | 150.0 | | |
| Base Capacity (vph) | 705 | 975 | 449 | 1235 | 316 | 602 | 106 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.00 | 0.70 | 0.42 | 0.10 | 0.54 | 0.52 | 0.01 |
| Intersection Summary | | | | | | | |

HCM Signalized Intersection Capacity Analysis
10: Vodden Street East & Howden Blvd

<Future>AM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|---------------------------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 2 | 307 | 373 | 188 | 123 | 0 | 170 | 5 | 307 | 1 | 0 | 0 |
| Future Volume (vph) | 2 | 307 | 373 | 188 | 123 | 0 | 170 | 5 | 307 | 1 | 0 | 0 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 3.0 | 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 | | |
| Frbp, ped/bikes | 1.00 | 0.98 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | | |
| Frt | 1.00 | 0.92 | | 1.00 | 1.00 | | 1.00 | 0.85 | | 1.00 | | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | | |
| Satd. Flow (prot) | 1773 | 1674 | | 1700 | 1808 | | 1746 | 1606 | | 1785 | | |
| Flt Permitted | 0.68 | 1.00 | | 0.24 | 1.00 | | 0.76 | 1.00 | | 0.25 | | |
| Satd. Flow (perm) | 1266 | 1674 | | 436 | 1808 | | 1392 | 1606 | | 468 | | |
| Peak-hour factor, PHF | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 2 | 307 | 373 | 188 | 123 | 0 | 170 | 5 | 307 | 1 | 0 | 0 |
| RTOR Reduction (vph) | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 250 | 0 | 0 | 0 | 0 |
| Lane Group Flow (vph) | 2 | 638 | 0 | 188 | 123 | 0 | 170 | 62 | 0 | 1 | 0 | 0 |
| Confl. Peds. (#/hr) | 3 | | 10 | 10 | | 3 | 1 | | | | | 1 |
| Heavy Vehicles (%) | 0% | 2% | 1% | 5% | 5% | 2% | 2% | 0% | 2% | 0% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | | Perm | | |
| Protected Phases | | 6 | | 5 | 2 | | | 8 | | | | 4 |
| Permitted Phases | 6 | | | 2 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 51.5 | 51.5 | | 63.1 | 63.1 | | 17.3 | 17.3 | | 17.3 | | |
| Effective Green, g (s) | 51.5 | 51.5 | | 63.1 | 63.1 | | 17.3 | 17.3 | | 17.3 | | |
| Actuated g/C Ratio | 0.56 | 0.56 | | 0.68 | 0.68 | | 0.19 | 0.19 | | 0.19 | | |
| Clearance Time (s) | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | | |
| Lane Grp Cap (vph) | 705 | 933 | | 415 | 1234 | | 260 | 300 | | 87 | | |
| v/s Ratio Prot | | c0.38 | | c0.04 | 0.07 | | | 0.04 | | | | |
| v/s Ratio Perm | 0.00 | | | 0.27 | | | c0.12 | | | 0.00 | | |
| v/c Ratio | 0.00 | 0.68 | | 0.45 | 0.10 | | 0.65 | 0.21 | | 0.01 | | |
| Uniform Delay, d1 | 9.1 | 14.6 | | 8.7 | 5.0 | | 34.8 | 31.8 | | 30.6 | | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | | |
| Incremental Delay, d2 | 0.0 | 4.1 | | 0.8 | 0.2 | | 7.7 | 0.7 | | 0.1 | | |
| Delay (s) | 9.1 | 18.7 | | 9.5 | 5.1 | | 42.5 | 32.5 | | 30.7 | | |
| Level of Service | A | B | | A | A | | D | C | | C | | |
| Approach Delay (s) | | 18.7 | | | 7.8 | | | 36.0 | | | | 30.7 |
| Approach LOS | | B | | | A | | | D | | | | C |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 22.0 | HCM 2000 Level of Service | | | | | | C | | |
| HCM 2000 Volume to Capacity ratio | | | 0.65 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 92.4 | Sum of lost time (s) | | | | | | 15.0 | | |
| Intersection Capacity Utilization | | | 82.6% | ICU Level of Service | | | | | | E | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
11: Howden Blvd/N Park Drive & Willams Parkway

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03-12-2020

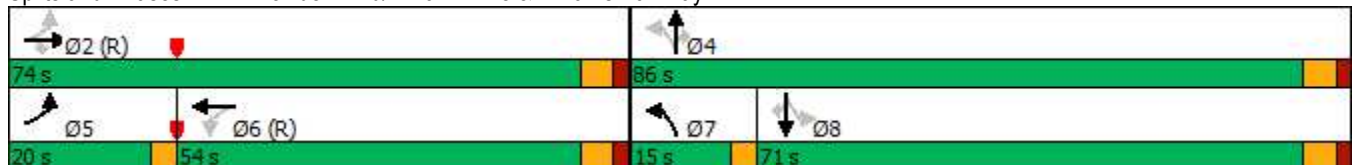


| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | NBR | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↘ | ↖ | ↗ | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ |
| Traffic Volume (vph) | 205 | 842 | 198 | 70 | 667 | 152 | 290 | 99 | 107 | 519 | 452 |
| Future Volume (vph) | 205 | 842 | 198 | 70 | 667 | 152 | 290 | 99 | 107 | 519 | 452 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | pm+pt | NA | Perm | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | 7 | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 4 | | 4 | 8 | | 8 |
| Detector Phase | 5 | 2 | 2 | 6 | 6 | 7 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | | |
| Minimum Initial (s) | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 9.0 | 43.0 | 43.0 | 43.0 | 43.0 | 9.0 | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 |
| Total Split (s) | 20.0 | 74.0 | 74.0 | 54.0 | 54.0 | 15.0 | 86.0 | 86.0 | 71.0 | 71.0 | 71.0 |
| Total Split (%) | 12.5% | 46.3% | 46.3% | 33.8% | 33.8% | 9.4% | 53.8% | 53.8% | 44.4% | 44.4% | 44.4% |
| Yellow Time (s) | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 0.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lead | | | Lag | Lag | Lead | | | Lag | Lag | Lag |
| Lead-Lag Optimize? | Yes | | | Yes | Yes | Yes | | | Yes | Yes | Yes |
| Recall Mode | None | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None | None |
| Act Effct Green (s) | 77.3 | 74.3 | 74.3 | 55.9 | 55.9 | 76.7 | 73.7 | 73.7 | 58.7 | 58.7 | 58.7 |
| Actuated g/C Ratio | 0.48 | 0.46 | 0.46 | 0.35 | 0.35 | 0.48 | 0.46 | 0.46 | 0.37 | 0.37 | 0.37 |
| v/c Ratio | 0.76 | 0.56 | 0.30 | 0.46 | 0.66 | 0.72 | 0.36 | 0.15 | 0.31 | 0.81 | 0.89 |
| Control Delay | 43.1 | 33.8 | 21.0 | 55.0 | 48.5 | 41.2 | 28.4 | 12.9 | 37.2 | 54.9 | 53.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 43.1 | 33.8 | 21.0 | 55.0 | 48.5 | 41.2 | 28.4 | 12.9 | 37.2 | 54.9 | 53.0 |
| LOS | D | C | C | D | D | D | C | B | D | D | D |
| Approach Delay | | 33.3 | | | 49.1 | | 29.2 | | | 52.4 | |
| Approach LOS | | C | | | D | | C | | | D | |

Intersection Summary

Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 75 (47%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.89
 Intersection Signal Delay: 41.8
 Intersection LOS: D
 Intersection Capacity Utilization 102.2%
 ICU Level of Service G
 Analysis Period (min) 15

Splits and Phases: 11: Howden Blvd/N Park Drive & Willams Parkway



Queues

<Future>AM

11: Howden Blvd/N Park Drive & Willams Parkway

03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|-------|------|------|-------|-------|-------|------|------|-------|-------|
| Lane Group Flow (vph) | 223 | 915 | 215 | 76 | 798 | 165 | 315 | 108 | 116 | 564 | 491 |
| v/c Ratio | 0.76 | 0.56 | 0.30 | 0.46 | 0.66 | 0.72 | 0.36 | 0.15 | 0.31 | 0.81 | 0.89 |
| Control Delay | 43.1 | 33.8 | 21.0 | 55.0 | 48.5 | 41.2 | 28.4 | 12.9 | 37.2 | 54.9 | 53.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 43.1 | 33.8 | 21.0 | 55.0 | 48.5 | 41.2 | 28.4 | 12.9 | 37.2 | 54.9 | 53.0 |
| Queue Length 50th (m) | 43.3 | 114.5 | 30.4 | 19.7 | 118.1 | 28.3 | 61.3 | 10.1 | 25.3 | 155.2 | 111.4 |
| Queue Length 95th (m) | #66.4 | 140.3 | 52.0 | 40.0 | 145.9 | #41.8 | 81.4 | 20.8 | 41.1 | 196.2 | 162.0 |
| Internal Link Dist (m) | | 268.4 | | | 661.6 | | 117.9 | | | 218.4 | |
| Turn Bay Length (m) | 162.0 | | 20.0 | 44.0 | | 52.5 | | 52.5 | 44.0 | | 21.5 |
| Base Capacity (vph) | 310 | 1632 | 717 | 167 | 1207 | 228 | 941 | 772 | 412 | 772 | 600 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.72 | 0.56 | 0.30 | 0.46 | 0.66 | 0.72 | 0.33 | 0.14 | 0.28 | 0.73 | 0.82 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 11: Howden Blvd/N Park Drive & Willams Parkway

<Future>AM
 03-12-2020



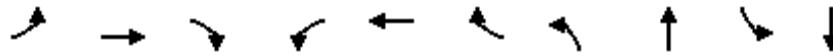
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---------------------------|-------|------|------|------|------|------|-------|------|------|------|------|-------|
| Lane Configurations | ↘ | ↑↑ | ↗ | ↘ | ↑↑ | | ↘ | ↑ | ↗ | ↘ | ↑ | ↗ |
| Traffic Volume (vph) | 205 | 842 | 198 | 70 | 667 | 67 | 152 | 290 | 99 | 107 | 519 | 452 |
| Future Volume (vph) | 205 | 842 | 198 | 70 | 667 | 67 | 152 | 290 | 99 | 107 | 519 | 452 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lane Util. Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.90 | 1.00 | 0.99 | | 1.00 | 1.00 | 0.96 | 1.00 | 1.00 | 0.83 |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | | 1.00 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 |
| Fr _t | 1.00 | 1.00 | 0.85 | 1.00 | 0.99 | | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Fl _t Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1761 | 3515 | 1472 | 1665 | 3443 | | 1750 | 1883 | 1496 | 1696 | 1902 | 1294 |
| Fl _t Permitted | 0.18 | 1.00 | 1.00 | 0.27 | 1.00 | | 0.14 | 1.00 | 1.00 | 0.57 | 1.00 | 1.00 |
| Satd. Flow (perm) | 333 | 3515 | 1472 | 479 | 3443 | | 250 | 1883 | 1496 | 1016 | 1902 | 1294 |
| 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) | 223 | 915 | 215 | 76 | 725 | 73 | 165 | 315 | 108 | 116 | 564 | 491 |
| RTOR Reduction (vph) | 0 | 0 | 34 | 0 | 5 | 0 | 0 | 0 | 26 | 0 | 0 | 80 |
| Lane Group Flow (vph) | 223 | 915 | 181 | 76 | 793 | 0 | 165 | 315 | 82 | 116 | 564 | 411 |
| Confl. Peds. (#/hr) | 63 | | 37 | 37 | | 63 | 137 | | 29 | 29 | | 137 |
| Heavy Vehicles (%) | 1% | 3% | 0% | 5% | 2% | 14% | 2% | 2% | 2% | 3% | 1% | 3% |
| Bus Blockages (#/hr) | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | | pm+pt | NA | Perm | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | | 7 | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | | 4 | | 4 | 8 | | 8 |
| Actuated Green, G (s) | 74.3 | 74.3 | 74.3 | 55.9 | 55.9 | | 73.7 | 73.7 | 73.7 | 58.7 | 58.7 | 58.7 |
| Effective Green, g (s) | 74.3 | 74.3 | 74.3 | 55.9 | 55.9 | | 73.7 | 73.7 | 73.7 | 58.7 | 58.7 | 58.7 |
| Actuated g/C Ratio | 0.46 | 0.46 | 0.46 | 0.35 | 0.35 | | 0.46 | 0.46 | 0.46 | 0.37 | 0.37 | 0.37 |
| Clearance Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 292 | 1632 | 683 | 167 | 1202 | | 227 | 867 | 689 | 372 | 697 | 474 |
| v/s Ratio Prot | c0.07 | 0.26 | | | 0.23 | | c0.05 | 0.17 | | | 0.30 | |
| v/s Ratio Perm | c0.28 | | 0.12 | 0.16 | | | 0.28 | | 0.05 | 0.11 | | c0.32 |
| v/c Ratio | 0.76 | 0.56 | 0.27 | 0.46 | 0.66 | | 0.73 | 0.36 | 0.12 | 0.31 | 0.81 | 0.87 |
| Uniform Delay, d1 | 30.2 | 31.0 | 26.2 | 40.3 | 44.0 | | 33.0 | 28.0 | 24.6 | 36.2 | 45.6 | 47.0 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 11.2 | 1.4 | 0.9 | 8.7 | 2.9 | | 11.0 | 0.5 | 0.2 | 1.0 | 7.8 | 16.6 |
| Delay (s) | 41.4 | 32.4 | 27.1 | 49.0 | 46.9 | | 44.0 | 28.5 | 24.8 | 37.2 | 53.4 | 63.6 |
| Level of Service | D | C | C | D | D | | D | C | C | D | D | E |
| Approach Delay (s) | | 33.1 | | | 47.1 | | | 32.2 | | | 56.1 | |
| Approach LOS | | C | | | D | | | C | | | E | |

| Intersection Summary | | |
|-----------------------------------|--------|---------------------------|
| HCM 2000 Control Delay | 42.8 | HCM 2000 Level of Service |
| HCM 2000 Volume to Capacity ratio | 0.82 | D |
| Actuated Cycle Length (s) | 160.0 | Sum of lost time (s) |
| Intersection Capacity Utilization | 102.2% | 18.0 |
| Analysis Period (min) | 15 | ICU Level of Service |
| | | G |

c Critical Lane Group

Timings
12: Dixie Road & Howden Blvd

<Future>AM
03-12-2020

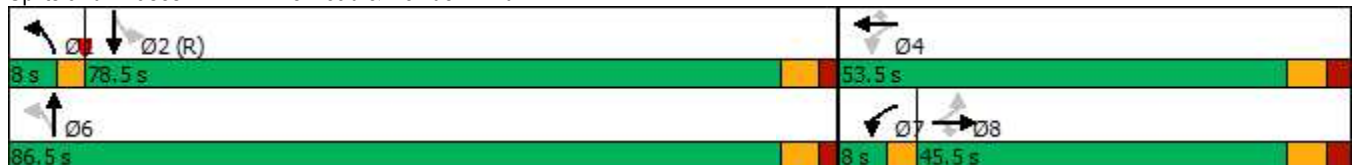


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↑ | ↗ | ↖ | ↑ | ↗ | ↖ | ↑↕ | ↖ | ↑↕ |
| Traffic Volume (vph) | 29 | 463 | 219 | 100 | 239 | 92 | 52 | 413 | 157 | 1701 |
| Future Volume (vph) | 29 | 463 | 219 | 100 | 239 | 92 | 52 | 413 | 157 | 1701 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | Perm | NA |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | 2 |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | 2 | |
| Detector Phase | 8 | 8 | 8 | 7 | 4 | 4 | 1 | 6 | 2 | 2 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 5.0 | 8.0 | 8.0 | 5.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.8 | 36.8 | 36.8 | 8.0 | 36.8 | 36.8 | 8.0 | 40.1 | 40.1 | 40.1 |
| Total Split (s) | 45.5 | 45.5 | 45.5 | 8.0 | 53.5 | 53.5 | 8.0 | 86.5 | 78.5 | 78.5 |
| Total Split (%) | 32.5% | 32.5% | 32.5% | 5.7% | 38.2% | 38.2% | 5.7% | 61.8% | 56.1% | 56.1% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 2.8 | 0.0 | 2.8 | 2.8 | 0.0 | 2.1 | 2.1 | 2.1 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.1 | 6.1 | 6.1 |
| Lead/Lag | Lag | Lag | Lag | Lead | | | Lead | | Lag | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | | | Yes | | Yes | Yes |
| Recall Mode | None | None | None | None | None | None | None | Max | C-Max | C-Max |
| Act Effct Green (s) | 38.7 | 38.7 | 38.7 | 50.5 | 46.7 | 46.7 | 83.5 | 80.4 | 74.0 | 74.0 |
| Actuated g/C Ratio | 0.28 | 0.28 | 0.28 | 0.36 | 0.33 | 0.33 | 0.60 | 0.57 | 0.53 | 0.53 |
| v/c Ratio | 0.10 | 0.99 | 0.50 | 0.89 | 0.44 | 0.17 | 0.47 | 0.28 | 0.39 | 1.00 |
| Control Delay | 39.0 | 86.9 | 31.3 | 92.7 | 39.3 | 6.6 | 26.3 | 14.8 | 23.5 | 52.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 39.0 | 86.9 | 31.3 | 92.7 | 39.3 | 6.6 | 26.3 | 14.8 | 23.5 | 52.9 |
| LOS | D | F | C | F | D | A | C | B | C | D |
| Approach Delay | | 67.9 | | | 44.8 | | | 15.9 | | 50.4 |
| Approach LOS | | E | | | D | | | B | | D |

Intersection Summary

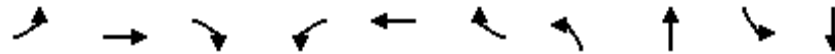
Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 107 (76%), Referenced to phase 2:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.00
 Intersection Signal Delay: 48.0
 Intersection LOS: D
 Intersection Capacity Utilization 99.4%
 ICU Level of Service F
 Analysis Period (min) 15

Splits and Phases: 12: Dixie Road & Howden Blvd



Queues
12: Dixie Road & Howden Blvd

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|------|--------|------|-------|-------|------|------|-------|------|--------|
| Lane Group Flow (vph) | 31 | 498 | 235 | 108 | 257 | 99 | 56 | 526 | 169 | 1849 |
| v/c Ratio | 0.10 | 0.99 | 0.50 | 0.89 | 0.44 | 0.17 | 0.47 | 0.28 | 0.39 | 1.00 |
| Control Delay | 39.0 | 86.9 | 31.3 | 92.7 | 39.3 | 6.6 | 26.3 | 14.8 | 23.5 | 52.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 39.0 | 86.9 | 31.3 | 92.7 | 39.3 | 6.6 | 26.3 | 14.8 | 23.5 | 52.9 |
| Queue Length 50th (m) | 6.4 | 137.8 | 35.5 | 20.3 | 55.5 | 0.0 | 6.2 | 35.4 | 27.7 | ~284.3 |
| Queue Length 95th (m) | 14.8 | #208.7 | 61.9 | #51.2 | 81.1 | 12.5 | 13.4 | 45.9 | 46.4 | #326.7 |
| Internal Link Dist (m) | | 661.5 | | | 187.9 | | | 169.3 | | 320.7 |
| Turn Bay Length (m) | 53.0 | | 53.0 | 66.0 | | 66.0 | 71.5 | | 40.0 | |
| Base Capacity (vph) | 306 | 505 | 474 | 121 | 587 | 583 | 118 | 1857 | 435 | 1857 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.10 | 0.99 | 0.50 | 0.89 | 0.44 | 0.17 | 0.47 | 0.28 | 0.39 | 1.00 |

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

12: Dixie Road & Howden Blvd

<Future>AM
03-12-2020

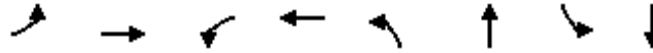


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | |
|-----------------------------------|------|------|-------|-------|---------------------------|------|-------|------|------|------|-------|------|--|
| Lane Configurations | ↙ | ↑ | ↘ | ↙ | ↑ | ↘ | ↙ | ↑↓ | | ↙ | ↑↓ | | |
| Traffic Volume (vph) | 29 | 463 | 219 | 100 | 239 | 92 | 52 | 413 | 76 | 157 | 1701 | 19 | |
| Future Volume (vph) | 29 | 463 | 219 | 100 | 239 | 92 | 52 | 413 | 76 | 157 | 1701 | 19 | |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | |
| Total Lost time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.1 | | 6.1 | 6.1 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.95 | | 1.00 | 0.95 | | |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.96 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | | |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | | |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.98 | | 1.00 | 1.00 | | |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | | |
| Satd. Flow (prot) | 1785 | 1828 | 1504 | 1767 | 1760 | 1551 | 1785 | 3214 | | 1715 | 3514 | | |
| Flt Permitted | 0.59 | 1.00 | 1.00 | 0.10 | 1.00 | 1.00 | 0.05 | 1.00 | | 0.46 | 1.00 | | |
| Satd. Flow (perm) | 1106 | 1828 | 1504 | 178 | 1760 | 1551 | 98 | 3214 | | 825 | 3514 | | |
| Peak-hour factor, PHF | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | |
| Adj. Flow (vph) | 31 | 498 | 235 | 108 | 257 | 99 | 56 | 444 | 82 | 169 | 1829 | 20 | |
| RTOR Reduction (vph) | 0 | 0 | 59 | 0 | 0 | 66 | 0 | 11 | 0 | 0 | 0 | 0 | |
| Lane Group Flow (vph) | 31 | 498 | 176 | 108 | 257 | 33 | 56 | 515 | 0 | 169 | 1849 | 0 | |
| Confl. Peds. (#/hr) | | | 20 | 20 | | | 14 | | 1 | 1 | | 14 | |
| Heavy Vehicles (%) | 0% | 3% | 2% | 1% | 7% | 3% | 0% | 9% | 6% | 4% | 2% | 0% | |
| Bus Blockages (#/hr) | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 9 | 0 | 0 | 8 | 0 | |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | | Perm | NA | | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | | 2 | | |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | | 2 | | | |
| Actuated Green, G (s) | 38.7 | 38.7 | 38.7 | 46.7 | 46.7 | 46.7 | 80.4 | 80.4 | | 73.4 | 73.4 | | |
| Effective Green, g (s) | 38.7 | 38.7 | 38.7 | 46.7 | 46.7 | 46.7 | 80.4 | 80.4 | | 73.4 | 73.4 | | |
| Actuated g/C Ratio | 0.28 | 0.28 | 0.28 | 0.33 | 0.33 | 0.33 | 0.57 | 0.57 | | 0.52 | 0.52 | | |
| Clearance Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.1 | | 6.1 | 6.1 | | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 3.0 | 5.0 | 5.0 | 3.0 | 5.0 | | 5.0 | 5.0 | | |
| Lane Grp Cap (vph) | 305 | 505 | 415 | 116 | 587 | 517 | 104 | 1845 | | 432 | 1842 | | |
| v/s Ratio Prot | | 0.27 | | c0.03 | 0.15 | | c0.02 | 0.16 | | | c0.53 | | |
| v/s Ratio Perm | 0.03 | | 0.12 | c0.28 | | 0.02 | 0.29 | | | 0.20 | | | |
| v/c Ratio | 0.10 | 0.99 | 0.43 | 0.93 | 0.44 | 0.06 | 0.54 | 0.28 | | 0.39 | 1.00 | | |
| Uniform Delay, d1 | 37.7 | 50.4 | 41.5 | 42.6 | 36.4 | 31.8 | 32.4 | 15.1 | | 19.9 | 33.3 | | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | | |
| Incremental Delay, d2 | 0.3 | 36.4 | 1.5 | 62.0 | 1.1 | 0.1 | 5.3 | 0.4 | | 2.7 | 21.8 | | |
| Delay (s) | 38.0 | 86.8 | 43.0 | 104.6 | 37.5 | 31.9 | 37.7 | 15.5 | | 22.6 | 55.1 | | |
| Level of Service | D | F | D | F | D | C | D | B | | C | E | | |
| Approach Delay (s) | | 71.3 | | | 51.9 | | | 17.6 | | | 52.4 | | |
| Approach LOS | | E | | | D | | | B | | | D | | |
| Intersection Summary | | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 50.8 | | HCM 2000 Level of Service | | | | | | D | | |
| HCM 2000 Volume to Capacity ratio | | | 0.98 | | | | | | | | | | |
| Actuated Cycle Length (s) | | | 140.0 | | Sum of lost time (s) | | | | | | 18.9 | | |
| Intersection Capacity Utilization | | | 99.4% | | ICU Level of Service | | | | | | F | | |
| Analysis Period (min) | | | 15 | | | | | | | | | | |

c Critical Lane Group

Timings
13: Hanover Road/Highview Trail & Howden Blvd

<Future>AM
03-12-2020

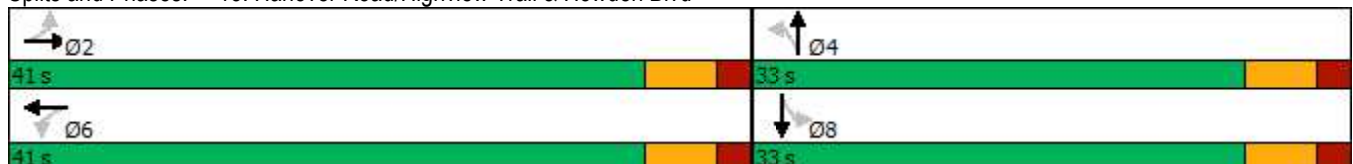


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | | ↕ |
| Traffic Volume (vph) | 11 | 631 | 22 | 252 | 154 | 6 | 11 | 14 |
| Future Volume (vph) | 11 | 631 | 22 | 252 | 154 | 6 | 11 | 14 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (s) | 41.0 | 41.0 | 41.0 | 41.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (%) | 55.4% | 55.4% | 55.4% | 55.4% | 44.6% | 44.6% | 44.6% | 44.6% |
| 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | Max | Max | Max | Max | None | None | None | None |
| Act Effct Green (s) | 40.2 | 40.2 | 40.2 | 40.2 | 14.8 | 14.8 | | 14.5 |
| Actuated g/C Ratio | 0.65 | 0.65 | 0.65 | 0.65 | 0.24 | 0.24 | | 0.23 |
| v/c Ratio | 0.02 | 0.80 | 0.14 | 0.24 | 0.53 | 0.08 | | 0.11 |
| Control Delay | 7.5 | 20.3 | 10.9 | 8.0 | 26.9 | 9.4 | | 13.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | 7.5 | 20.3 | 10.9 | 8.0 | 26.9 | 9.4 | | 13.2 |
| LOS | A | C | B | A | C | A | | B |
| Approach Delay | | 20.2 | | 8.2 | | 24.0 | | 13.3 |
| Approach LOS | | C | | A | | C | | B |

Intersection Summary

Cycle Length: 74
 Actuated Cycle Length: 62.3
 Natural Cycle: 90
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 18.0
 Intersection Capacity Utilization 75.1%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 13: Hanover Road/Highview Trail & Howden Blvd

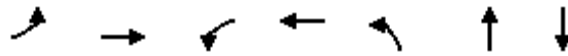


Queues

<Future>AM

13: Hanover Road/Highview Trail & Howden Blvd

03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBT |
|------------------------|------|--------|-------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 12 | 932 | 24 | 282 | 167 | 33 | 43 |
| v/c Ratio | 0.02 | 0.80 | 0.14 | 0.24 | 0.53 | 0.08 | 0.11 |
| Control Delay | 7.5 | 20.3 | 10.9 | 8.0 | 26.9 | 9.4 | 13.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 7.5 | 20.3 | 10.9 | 8.0 | 26.9 | 9.4 | 13.2 |
| Queue Length 50th (m) | 0.5 | 81.5 | 1.2 | 14.4 | 16.6 | 0.6 | 2.4 |
| Queue Length 95th (m) | 2.9 | #188.9 | 6.0 | 32.3 | 32.1 | 6.0 | 8.5 |
| Internal Link Dist (m) | | 187.9 | | 607.3 | | 181.5 | 108.7 |
| Turn Bay Length (m) | 70.0 | | 100.0 | | 100.0 | | |
| Base Capacity (vph) | 707 | 1163 | 167 | 1189 | 578 | 729 | 730 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.02 | 0.80 | 0.14 | 0.24 | 0.29 | 0.05 | 0.06 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 13: Hanover Road/Highview Trail & Howden Blvd

<Future>AM
 03-12-2020



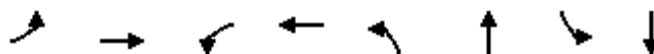
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|-------|------|------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | | ↕ | |
| Traffic Volume (vph) | 11 | 631 | 226 | 22 | 252 | 7 | 154 | 6 | 24 | 11 | 14 | 15 |
| Future Volume (vph) | 11 | 631 | 226 | 22 | 252 | 7 | 154 | 6 | 24 | 11 | 14 | 15 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 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 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 0.97 | | | 0.99 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Frt | 1.00 | 0.96 | | 1.00 | 1.00 | | 1.00 | 0.88 | | | 0.95 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | | 0.99 | |
| Satd. Flow (prot) | 1775 | 1785 | | 1620 | 1840 | | 1731 | 1646 | | | 1777 | |
| Flt Permitted | 0.59 | 1.00 | | 0.15 | 1.00 | | 0.73 | 1.00 | | | 0.92 | |
| Satd. Flow (perm) | 1096 | 1785 | | 259 | 1840 | | 1328 | 1646 | | | 1659 | |
| 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) | 12 | 686 | 246 | 24 | 274 | 8 | 167 | 7 | 26 | 12 | 15 | 16 |
| RTOR Reduction (vph) | 0 | 13 | 0 | 0 | 1 | 0 | 0 | 21 | 0 | 0 | 13 | 0 |
| Lane Group Flow (vph) | 12 | 919 | 0 | 24 | 281 | 0 | 167 | 12 | 0 | 0 | 30 | 0 |
| Confl. Peds. (#/hr) | 7 | | 9 | 9 | | 7 | 1 | | 14 | 14 | | 1 |
| Heavy Vehicles (%) | 0% | 2% | 4% | 10% | 4% | 0% | 3% | 0% | 0% | 0% | 0% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | |
| Actuated Green, G (s) | 38.9 | 38.9 | | 38.9 | 38.9 | | 12.7 | 12.7 | | | 12.7 | |
| Effective Green, g (s) | 38.9 | 38.9 | | 38.9 | 38.9 | | 12.7 | 12.7 | | | 12.7 | |
| Actuated g/C Ratio | 0.61 | 0.61 | | 0.61 | 0.61 | | 0.20 | 0.20 | | | 0.20 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | 670 | 1091 | | 158 | 1125 | | 265 | 328 | | | 331 | |
| v/s Ratio Prot | | c0.51 | | | 0.15 | | | 0.01 | | | | |
| v/s Ratio Perm | 0.01 | | | 0.09 | | | c0.13 | | | | 0.02 | |
| v/c Ratio | 0.02 | 0.84 | | 0.15 | 0.25 | | 0.63 | 0.04 | | | 0.09 | |
| Uniform Delay, d1 | 4.8 | 9.9 | | 5.3 | 5.7 | | 23.3 | 20.5 | | | 20.7 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | 0.0 | 7.9 | | 2.0 | 0.5 | | 6.6 | 0.1 | | | 0.3 | |
| Delay (s) | 4.9 | 17.8 | | 7.3 | 6.2 | | 29.9 | 20.6 | | | 21.0 | |
| Level of Service | A | B | | A | A | | C | C | | | C | |
| Approach Delay (s) | | 17.7 | | | 6.3 | | | 28.4 | | | 21.0 | |
| Approach LOS | | B | | | A | | | C | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 16.9 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.79 | | |
| Actuated Cycle Length (s) | 63.6 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 75.1% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

Timings
14: Central Park Drive & Hanover Road

<Future>AM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↕ | ↗ | ↖ | ↖ | ↖ | ↕ | | ↕ |
| Traffic Volume (vph) | 71 | 6 | 5 | 2 | 129 | 207 | 7 | 780 |
| Future Volume (vph) | 71 | 6 | 5 | 2 | 129 | 207 | 7 | 780 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 4 | | 4 | | 2 | | 2 |
| Permitted Phases | 4 | | 4 | | 2 | | 2 | |
| Detector Phase | 4 | 4 | 4 | 4 | 2 | 2 | 2 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (%) | 54.8% | 54.8% | 54.8% | 54.8% | 45.2% | 45.2% | 45.2% | 45.2% |
| 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | Max | Max | Max | Max |
| Act Effct Green (s) | 18.8 | 18.8 | 18.8 | 18.8 | 22.3 | 22.3 | | 22.3 |
| Actuated g/C Ratio | 0.35 | 0.35 | 0.35 | 0.35 | 0.42 | 0.42 | | 0.42 |
| v/c Ratio | 0.16 | 0.64 | 0.02 | 0.02 | 0.77 | 0.17 | | 0.63 |
| Control Delay | 11.8 | 18.0 | 10.0 | 6.5 | 51.0 | 11.1 | | 15.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | 11.8 | 18.0 | 10.0 | 6.5 | 51.0 | 11.1 | | 15.9 |
| LOS | B | B | A | A | D | B | | B |
| Approach Delay | | 17.0 | | 7.6 | | 25.8 | | 15.9 |
| Approach LOS | | B | | A | | C | | B |

Intersection Summary

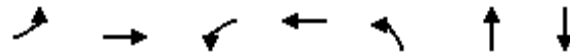
Cycle Length: 62
 Actuated Cycle Length: 53.2
 Natural Cycle: 70
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.77
 Intersection Signal Delay: 18.3
 Intersection Capacity Utilization 78.4%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 14: Central Park Drive & Hanover Road



14: Central Park Drive & Hanover Road

03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 77 | 366 | 5 | 11 | 140 | 239 | 882 |
| v/c Ratio | 0.16 | 0.64 | 0.02 | 0.02 | 0.77 | 0.17 | 0.63 |
| Control Delay | 11.8 | 18.0 | 10.0 | 6.5 | 51.0 | 11.1 | 15.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.8 | 18.0 | 10.0 | 6.5 | 51.0 | 11.1 | 15.9 |
| Queue Length 50th (m) | 4.8 | 25.0 | 0.3 | 0.1 | 10.8 | 6.7 | 32.7 |
| Queue Length 95th (m) | 11.4 | 45.7 | 1.8 | 2.4 | #44.7 | 16.1 | 64.0 |
| Internal Link Dist (m) | | 532.7 | | 113.0 | | 177.3 | 377.5 |
| Turn Bay Length (m) | 100.0 | | | | 44.5 | | |
| Base Capacity (vph) | 708 | 848 | 461 | 886 | 181 | 1411 | 1405 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.11 | 0.43 | 0.01 | 0.01 | 0.77 | 0.17 | 0.63 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
14: Central Park Drive & Hanover Road

<Future>AM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|-------|-------|------|------|------|---------------------------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↕ | | | ↕ | |
| Traffic Volume (vph) | 71 | 6 | 330 | 5 | 2 | 8 | 129 | 207 | 13 | 7 | 780 | 24 |
| Future Volume (vph) | 71 | 6 | 330 | 5 | 2 | 8 | 129 | 207 | 13 | 7 | 780 | 24 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 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 | 0.95 | | | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.98 | | 1.00 | 0.98 | | 1.00 | 1.00 | | | 1.00 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | | 1.00 | |
| Frt | 1.00 | 0.85 | | 1.00 | 0.88 | | 1.00 | 0.99 | | | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | | 1.00 | |
| Satd. Flow (prot) | 1686 | 1562 | | 1777 | 1657 | | 1609 | 3358 | | | 3516 | |
| Flt Permitted | 0.75 | 1.00 | | 0.46 | 1.00 | | 0.25 | 1.00 | | | 0.95 | |
| Satd. Flow (perm) | 1332 | 1562 | | 867 | 1657 | | 431 | 3358 | | | 3348 | |
| 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 | 7 | 359 | 5 | 2 | 9 | 140 | 225 | 14 | 8 | 848 | 26 |
| RTOR Reduction (vph) | 0 | 23 | 0 | 0 | 6 | 0 | 0 | 6 | 0 | 0 | 3 | 0 |
| Lane Group Flow (vph) | 77 | 343 | 0 | 5 | 5 | 0 | 140 | 233 | 0 | 0 | 879 | 0 |
| Confl. Peds. (#/hr) | 15 | | 13 | 13 | | 15 | 27 | | 13 | 13 | | 27 |
| Heavy Vehicles (%) | 5% | 0% | 3% | 0% | 0% | 0% | 10% | 8% | 0% | 0% | 3% | 9% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 4 | | | 2 | | | 2 | |
| Permitted Phases | 4 | | | 4 | | | 2 | | | 2 | | |
| Actuated Green, G (s) | 18.7 | 18.7 | | 18.7 | 18.7 | | 22.3 | 22.3 | | | 22.3 | |
| Effective Green, g (s) | 18.7 | 18.7 | | 18.7 | 18.7 | | 22.3 | 22.3 | | | 22.3 | |
| Actuated g/C Ratio | 0.35 | 0.35 | | 0.35 | 0.35 | | 0.42 | 0.42 | | | 0.42 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | 469 | 551 | | 305 | 584 | | 181 | 1412 | | | 1408 | |
| v/s Ratio Prot | | c0.22 | | | 0.00 | | | 0.07 | | | | |
| v/s Ratio Perm | 0.06 | | | 0.01 | | | c0.32 | | | | 0.26 | |
| v/c Ratio | 0.16 | 0.62 | | 0.02 | 0.01 | | 0.77 | 0.16 | | | 0.62 | |
| Uniform Delay, d1 | 11.8 | 14.2 | | 11.2 | 11.1 | | 13.2 | 9.6 | | | 12.1 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | 0.3 | 3.1 | | 0.0 | 0.0 | | 26.9 | 0.3 | | | 2.1 | |
| Delay (s) | 12.1 | 17.3 | | 11.2 | 11.1 | | 40.1 | 9.8 | | | 14.2 | |
| Level of Service | B | B | | B | B | | D | A | | | B | |
| Approach Delay (s) | | 16.4 | | | 11.2 | | | 21.0 | | | 14.2 | |
| Approach LOS | | B | | | B | | | C | | | B | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 16.2 | | | | HCM 2000 Level of Service | | | | B | |
| HCM 2000 Volume to Capacity ratio | | | 0.70 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 53.0 | | | | Sum of lost time (s) | | | 12.0 | | |
| Intersection Capacity Utilization | | | 78.4% | | | | ICU Level of Service | | | D | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |
| c Critical Lane Group | | | | | | | | | | | | |

Timings
15: Central Park Drive & Howden Blvd

<Future>AM
03-12-2020



| Lane Group | EBL | EBR | NBL | NBT | SBT |
|----------------------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | |
| Traffic Volume (vph) | 228 | 282 | 62 | 178 | 464 |
| Future Volume (vph) | 228 | 282 | 62 | 178 | 464 |
| Turn Type | Prot | Prot | Perm | NA | NA |
| Protected Phases | 4 | 4 | | 2 | 2 |
| Permitted Phases | | | 2 | | |
| Detector Phase | 4 | 4 | 2 | 2 | 2 |
| Switch Phase | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 54.5% | 54.5% | 45.5% | 45.5% | 45.5% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | |
| Lead-Lag Optimize? | | | | | |
| Recall Mode | None | None | Max | Max | Max |
| Act Effct Green (s) | 15.1 | 15.1 | 24.2 | 24.2 | 24.2 |
| Actuated g/C Ratio | 0.29 | 0.29 | 0.47 | 0.47 | 0.47 |
| v/c Ratio | 0.48 | 0.53 | 0.22 | 0.12 | 0.43 |
| Control Delay | 17.7 | 11.2 | 12.3 | 9.1 | 9.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.7 | 11.2 | 12.3 | 9.1 | 9.6 |
| LOS | B | B | B | A | A |
| Approach Delay | 14.1 | | | 9.9 | 9.6 |
| Approach LOS | B | | | A | A |

Intersection Summary

Cycle Length: 66
 Actuated Cycle Length: 51.4
 Natural Cycle: 70
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.53
 Intersection Signal Delay: 11.3
 Intersection Capacity Utilization 54.7%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 15: Central Park Drive & Howden Blvd



Queues

<Future>AM

15: Central Park Drive & Howden Blvd

03-12-2020



| Lane Group | EBL | EBR | NBL | NBT | SBT |
|------------------------|-------|------|------|-------|-------|
| Lane Group Flow (vph) | 248 | 307 | 67 | 193 | 693 |
| v/c Ratio | 0.48 | 0.53 | 0.22 | 0.12 | 0.43 |
| Control Delay | 17.7 | 11.2 | 12.3 | 9.1 | 9.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.7 | 11.2 | 12.3 | 9.1 | 9.6 |
| Queue Length 50th (m) | 18.3 | 11.2 | 3.3 | 4.7 | 16.9 |
| Queue Length 95th (m) | 33.4 | 27.3 | 12.4 | 11.8 | 36.1 |
| Internal Link Dist (m) | 607.3 | | | 377.5 | 147.1 |
| Turn Bay Length (m) | 250.0 | | 65.0 | | |
| Base Capacity (vph) | 1041 | 1002 | 304 | 1619 | 1622 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.24 | 0.31 | 0.22 | 0.12 | 0.43 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis
15: Central Park Drive & Howden Blvd

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















| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|------------------------|-------|------|------|------|-------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 228 | 282 | 62 | 178 | 464 | 174 |
| Future Volume (vph) | 228 | 282 | 62 | 178 | 464 | 174 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 0.95 | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | 0.99 | 1.00 | 1.00 | |
| Frt | 1.00 | 0.85 | 1.00 | 1.00 | 0.96 | |
| Flt Protected | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 | |
| Satd. Flow (prot) | 1772 | 1601 | 1652 | 3444 | 3354 | |
| Flt Permitted | 0.95 | 1.00 | 0.37 | 1.00 | 1.00 | |
| Satd. Flow (perm) | 1772 | 1601 | 650 | 3444 | 3354 | |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj. Flow (vph) | 248 | 307 | 67 | 193 | 504 | 189 |
| RTOR Reduction (vph) | 0 | 104 | 0 | 0 | 49 | 0 |
| Lane Group Flow (vph) | 248 | 203 | 67 | 193 | 644 | 0 |
| Confl. Peds. (#/hr) | 3 | 1 | 24 | | | 24 |
| Heavy Vehicles (%) | 3% | 2% | 7% | 6% | 2% | 6% |
| Turn Type | Prot | Prot | Perm | NA | NA | |
| Protected Phases | 4 | 4 | | 2 | 2 | |
| Permitted Phases | | | 2 | | | |
| Actuated Green, G (s) | 15.2 | 15.2 | 24.2 | 24.2 | 24.2 | |
| Effective Green, g (s) | 15.2 | 15.2 | 24.2 | 24.2 | 24.2 | |
| Actuated g/C Ratio | 0.30 | 0.30 | 0.47 | 0.47 | 0.47 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 524 | 473 | 306 | 1621 | 1579 | |
| v/s Ratio Prot | c0.14 | 0.13 | | 0.06 | c0.19 | |
| v/s Ratio Perm | | | 0.10 | | | |
| v/c Ratio | 0.47 | 0.43 | 0.22 | 0.12 | 0.41 | |
| Uniform Delay, d1 | 14.8 | 14.6 | 8.0 | 7.6 | 8.9 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | 1.4 | 1.3 | 1.6 | 0.2 | 0.8 | |
| Delay (s) | 16.2 | 15.9 | 9.7 | 7.8 | 9.7 | |
| Level of Service | B | B | A | A | A | |
| Approach Delay (s) | 16.1 | | | 8.3 | 9.7 | |
| Approach LOS | B | | | A | A | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 11.8 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.43 | | |
| Actuated Cycle Length (s) | 51.4 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 54.7% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

HCM Unsignalized Intersection Capacity Analysis
 16: Isabella Street & Vodden Street West

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 03-12-2020

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | |  |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 8 | 449 | 22 | 20 | 135 | 8 | 15 | 20 | 42 | 51 | 53 | 10 |
| Future Volume (vph) | 8 | 449 | 22 | 20 | 135 | 8 | 15 | 20 | 42 | 51 | 53 | 10 |
| 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) | 9 | 488 | 24 | 22 | 147 | 9 | 16 | 22 | 46 | 55 | 58 | 11 |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | | |
| Volume Total (vph) | 521 | 22 | 156 | 84 | 124 | | | | | | | |
| Volume Left (vph) | 9 | 22 | 0 | 16 | 55 | | | | | | | |
| Volume Right (vph) | 24 | 0 | 9 | 46 | 11 | | | | | | | |
| Hadj (s) | 0.04 | 0.58 | 0.08 | -0.27 | 0.13 | | | | | | | |
| Departure Headway (s) | 5.0 | 6.3 | 5.8 | 5.7 | 6.0 | | | | | | | |
| Degree Utilization, x | 0.72 | 0.04 | 0.25 | 0.13 | 0.21 | | | | | | | |
| Capacity (veh/h) | 521 | 534 | 586 | 555 | 534 | | | | | | | |
| Control Delay (s) | 19.5 | 8.3 | 9.5 | 9.5 | 10.5 | | | | | | | |
| Approach Delay (s) | 19.5 | 9.4 | | 9.5 | 10.5 | | | | | | | |
| Approach LOS | C | A | | A | B | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 15.3 | | | | | | | | | |
| Level of Service | | | C | | | | | | | | | |
| Intersection Capacity Utilization | | | 51.0% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 17: Lansdowne Drive/Lakeridge Drive & Vodden Street East

<Future>AM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 8 | 761 | 2 | 13 | 436 | 8 | 5 | 3 | 21 | 30 | 0 | 13 |
| Future Volume (Veh/h) | 8 | 761 | 2 | 13 | 436 | 8 | 5 | 3 | 21 | 30 | 0 | 13 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 9 | 827 | 2 | 14 | 474 | 9 | 5 | 3 | 23 | 33 | 0 | 14 |
| Pedestrians | | | | | 2 | | | 1 | | | 2 | |
| Lane Width (m) | | | | | 3.6 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | | | | 0 | | | 0 | | | 0 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | 290 | | | | | | | |
| pX, platoon unblocked | 0.94 | | | | | | 0.94 | 0.94 | | 0.94 | 0.94 | 0.94 |
| vC, conflicting volume | 485 | | | 830 | | | 1363 | 1360 | 831 | 1380 | 1356 | 480 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 425 | | | 830 | | | 1355 | 1352 | 831 | 1373 | 1348 | 421 |
| tC, single (s) | 4.2 | | | 4.2 | | | 7.1 | 6.8 | 6.2 | 7.1 | 6.5 | 6.4 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.3 | | | 2.3 | | | 3.5 | 4.3 | 3.3 | 3.5 | 4.0 | 3.4 |
| p0 queue free % | 99 | | | 98 | | | 96 | 97 | 94 | 69 | 100 | 98 |
| cM capacity (veh/h) | 1016 | | | 776 | | | 115 | 119 | 372 | 105 | 138 | 569 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 9 | 829 | 14 | 483 | 31 | 47 | | | | | | |
| Volume Left | 9 | 0 | 14 | 0 | 5 | 33 | | | | | | |
| Volume Right | 0 | 2 | 0 | 9 | 23 | 14 | | | | | | |
| cSH | 1016 | 1700 | 776 | 1700 | 237 | 139 | | | | | | |
| Volume to Capacity | 0.01 | 0.49 | 0.02 | 0.28 | 0.13 | 0.34 | | | | | | |
| Queue Length 95th (m) | 0.2 | 0.0 | 0.4 | 0.0 | 3.4 | 10.4 | | | | | | |
| Control Delay (s) | 8.6 | 0.0 | 9.7 | 0.0 | 22.4 | 43.6 | | | | | | |
| Lane LOS | A | | A | | C | E | | | | | | |
| Approach Delay (s) | 0.1 | | 0.3 | | 22.4 | 43.6 | | | | | | |
| Approach LOS | | | | | C | E | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 2.1 | | | | | | | | | |
| Intersection Capacity Utilization | | | 54.4% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 18: Howden Blvd & Lindridge Avenue/Leander Street

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 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↔ | | | ↔ | | ↗ | ↘ | | ↗ | ↘ | |
| Traffic Volume (veh/h) | 16 | 2 | 34 | 43 | 3 | 44 | 6 | 239 | 14 | 17 | 695 | 19 |
| Future Volume (Veh/h) | 16 | 2 | 34 | 43 | 3 | 44 | 6 | 239 | 14 | 17 | 695 | 19 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 17 | 2 | 37 | 47 | 3 | 48 | 7 | 260 | 15 | 18 | 755 | 21 |
| Pedestrians | | 6 | | | 5 | | | | | | | 4 |
| Lane Width (m) | | 3.7 | | | 3.7 | | | | | | | 3.6 |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | | | | | 1.1 |
| Percent Blockage | | 1 | | | 0 | | | | | | | 0 |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | | None |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | | 142 |
| pX, platoon unblocked | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | | 0.73 | | | | | |
| vC, conflicting volume | 1135 | 1102 | 772 | 1116 | 1104 | 276 | 782 | | | 280 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 998 | 952 | 498 | 971 | 956 | 276 | 512 | | | 280 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 88 | 99 | 91 | 69 | 98 | 94 | 99 | | | 99 | | |
| cM capacity (veh/h) | 146 | 184 | 417 | 149 | 183 | 761 | 769 | | | 1288 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 56 | 98 | 7 | 275 | 18 | 776 | | | | | | |
| Volume Left | 17 | 47 | 7 | 0 | 18 | 0 | | | | | | |
| Volume Right | 37 | 48 | 0 | 15 | 0 | 21 | | | | | | |
| cSH | 259 | 248 | 769 | 1700 | 1288 | 1700 | | | | | | |
| Volume to Capacity | 0.22 | 0.39 | 0.01 | 0.16 | 0.01 | 0.46 | | | | | | |
| Queue Length 95th (m) | 6.1 | 13.6 | 0.2 | 0.0 | 0.3 | 0.0 | | | | | | |
| Control Delay (s) | 22.7 | 28.6 | 9.7 | 0.0 | 7.8 | 0.0 | | | | | | |
| Lane LOS | C | D | A | | A | | | | | | | |
| Approach Delay (s) | 22.7 | 28.6 | 0.2 | | 0.2 | | | | | | | |
| Approach LOS | C | D | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 3.5 | | | | | | | | | |
| Intersection Capacity Utilization | | | 53.6% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 19: Hanover Road & Homeland Ct/Huntington Ct

<Future>AM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↕ | | | ↕ | | ↗ | ↘ | | ↗ | ↘ | |
| Traffic Volume (veh/h) | 15 | 0 | 5 | 10 | 0 | 12 | 2 | 173 | 6 | 7 | 220 | 7 |
| Future Volume (Veh/h) | 15 | 0 | 5 | 10 | 0 | 12 | 2 | 173 | 6 | 7 | 220 | 7 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 16 | 0 | 5 | 11 | 0 | 13 | 2 | 188 | 7 | 8 | 239 | 8 |
| Pedestrians | | 29 | | | 28 | | | 60 | | | 1 | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.6 | | | 3.6 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 3 | | | 3 | | | 5 | | | 0 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage veh | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | 205 | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 494 | 515 | 332 | 544 | 516 | 220 | 276 | | | 223 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 494 | 515 | 332 | 544 | 516 | 220 | 276 | | | 223 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 96 | 100 | 99 | 97 | 100 | 98 | 100 | | | 99 | | |
| cM capacity (veh/h) | 446 | 436 | 657 | 395 | 436 | 802 | 1263 | | | 1322 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 21 | 24 | 2 | 195 | 8 | 247 | | | | | | |
| Volume Left | 16 | 11 | 2 | 0 | 8 | 0 | | | | | | |
| Volume Right | 5 | 13 | 0 | 7 | 0 | 8 | | | | | | |
| cSH | 483 | 545 | 1263 | 1700 | 1322 | 1700 | | | | | | |
| Volume to Capacity | 0.04 | 0.04 | 0.00 | 0.11 | 0.01 | 0.15 | | | | | | |
| Queue Length 95th (m) | 1.0 | 1.0 | 0.0 | 0.0 | 0.1 | 0.0 | | | | | | |
| Control Delay (s) | 12.8 | 11.9 | 7.9 | 0.0 | 7.7 | 0.0 | | | | | | |
| Lane LOS | B | B | A | | A | | | | | | | |
| Approach Delay (s) | 12.8 | 11.9 | 0.1 | | 0.2 | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 1.3 | | | | | | | | | |
| Intersection Capacity Utilization | | | 31.5% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

Timings
7: Rutherford Road North & Vodden Street East

<Future>AM
06-01-2020



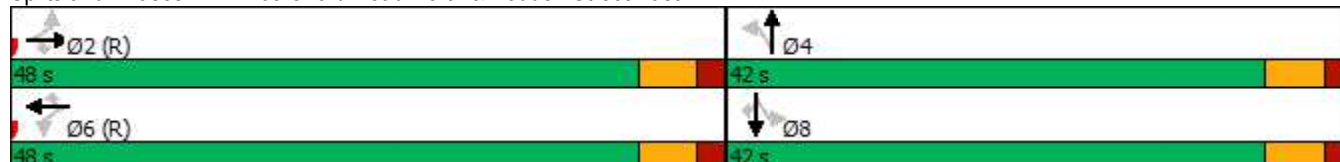
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↖ | ↗ | ↖ | ↖ | ↗ | ↖ | ↗ | ↖ |
| Traffic Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 92 | 406 | 126 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | 8 | | 8 |
| Detector Phase | 2 | 2 | 2 | 6 | 6 | 6 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 42.0 | 42.0 | 42.0 | 42.0 | 42.0 |
| Total Split (%) | 53.3% | 53.3% | 53.3% | 53.3% | 53.3% | 53.3% | 46.7% | 46.7% | 46.7% | 46.7% | 46.7% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 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 | 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 | 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 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 28.5 | 28.5 | 28.5 | 28.5 | 28.5 |
| Actuated g/C Ratio | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 |
| v/c Ratio | 0.26 | 0.46 | 0.23 | 0.17 | 0.36 | 0.09 | 0.50 | 0.36 | 0.29 | 0.72 | 0.24 |
| Control Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| LOS | B | B | A | B | B | A | D | C | C | C | A |
| Approach Delay | | 11.0 | | | 12.8 | | | 25.7 | | 26.4 | |
| Approach LOS | | B | | | B | | | C | | C | |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 17.8
 Intersection Capacity Utilization 80.7%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service D

Splits and Phases: 7: Rutherford Road North & Vodden Street East



Queues

<Future>AM

7: Rutherford Road North & Vodden Street East

06-01-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|------------------------|-------|-------|------|------|-------|------|------|-------|------|-------|------|
| Lane Group Flow (vph) | 119 | 465 | 202 | 70 | 360 | 72 | 76 | 200 | 96 | 423 | 131 |
| v/c Ratio | 0.26 | 0.46 | 0.23 | 0.17 | 0.36 | 0.09 | 0.50 | 0.36 | 0.29 | 0.72 | 0.24 |
| Control Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.9 | 13.8 | 4.0 | 13.2 | 14.4 | 4.5 | 35.5 | 22.0 | 23.8 | 33.7 | 4.5 |
| Queue Length 50th (m) | 12.1 | 53.1 | 7.5 | 7.3 | 41.7 | 1.6 | 10.5 | 23.6 | 12.3 | 63.5 | 0.0 |
| Queue Length 95th (m) | m21.8 | 93.8 | 13.9 | 18.9 | 74.6 | 9.2 | 22.2 | 36.2 | 21.8 | 84.0 | 10.2 |
| Internal Link Dist (m) | | 358.4 | | | 418.5 | | | 288.8 | | 340.1 | |
| Turn Bay Length (m) | 50.0 | | 50.0 | 48.5 | | 48.5 | 47.5 | | 41.5 | | 44.5 |
| Base Capacity (vph) | 465 | 1016 | 887 | 411 | 987 | 819 | 190 | 694 | 411 | 744 | 668 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.26 | 0.46 | 0.23 | 0.17 | 0.36 | 0.09 | 0.40 | 0.29 | 0.23 | 0.57 | 0.20 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
7: Rutherford Road North & Vodden Street East

<Future>AM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|-------|------|------|------|------|------|------|------|------|-------|------|
| Lane Configurations | ↖ | ↑ | ↗ | ↖ | ↑ | ↗ | ↖ | ↗ | | ↖ | ↑ | ↗ |
| Traffic Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Future Volume (vph) | 114 | 446 | 194 | 67 | 346 | 69 | 73 | 152 | 40 | 92 | 406 | 126 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 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 | | 1.00 | 1.00 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.93 | 1.00 | 1.00 | 0.91 | 1.00 | 0.98 | | 1.00 | 1.00 | 0.96 |
| Flpb, ped/bikes | 0.96 | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 0.99 | 1.00 | | 0.96 | 1.00 | 1.00 |
| FrT | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| FlT Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1605 | 1850 | 1449 | 1713 | 1798 | 1431 | 1609 | 1710 | | 1644 | 1861 | 1475 |
| FlT Permitted | 0.50 | 1.00 | 1.00 | 0.41 | 1.00 | 1.00 | 0.28 | 1.00 | | 0.59 | 1.00 | 1.00 |
| Satd. Flow (perm) | 846 | 1850 | 1449 | 748 | 1798 | 1431 | 478 | 1710 | | 1029 | 1861 | 1475 |
| Peak-hour factor, PHF | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 |
| Adj. Flow (vph) | 119 | 465 | 202 | 70 | 360 | 72 | 76 | 158 | 42 | 96 | 423 | 131 |
| RTOR Reduction (vph) | 0 | 0 | 91 | 0 | 0 | 32 | 0 | 12 | 0 | 0 | 0 | 90 |
| Lane Group Flow (vph) | 119 | 465 | 111 | 70 | 360 | 40 | 76 | 188 | 0 | 96 | 423 | 41 |
| Confl. Peds. (#/hr) | 45 | | 31 | 31 | | 45 | 13 | | 37 | 37 | | 13 |
| Heavy Vehicles (%) | 7% | 3% | 3% | 2% | 6% | 2% | 10% | 6% | 5% | 4% | 2% | 4% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 3 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 28.5 | 28.5 | | 28.5 | 28.5 | 28.5 |
| Effective Green, g (s) | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 28.5 | 28.5 | | 28.5 | 28.5 | 28.5 |
| Actuated g/C Ratio | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.32 | 0.32 | | 0.32 | 0.32 | 0.32 |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 465 | 1017 | 796 | 411 | 988 | 787 | 151 | 541 | | 325 | 589 | 467 |
| v/s Ratio Prot | | c0.25 | | | 0.20 | | | 0.11 | | | c0.23 | |
| v/s Ratio Perm | 0.14 | | 0.08 | 0.09 | | 0.03 | 0.16 | | | 0.09 | | 0.03 |
| v/c Ratio | 0.26 | 0.46 | 0.14 | 0.17 | 0.36 | 0.05 | 0.50 | 0.35 | | 0.30 | 0.72 | 0.09 |
| Uniform Delay, d1 | 10.6 | 12.2 | 9.9 | 10.1 | 11.4 | 9.4 | 25.0 | 23.6 | | 23.2 | 27.2 | 21.6 |
| Progression Factor | 0.82 | 0.90 | 1.63 | 0.96 | 1.03 | 1.25 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 1.1 | 1.2 | 0.3 | 0.8 | 1.0 | 0.1 | 5.4 | 0.8 | | 1.1 | 5.2 | 0.2 |
| Delay (s) | 9.8 | 12.2 | 16.4 | 10.5 | 12.7 | 11.9 | 30.4 | 24.4 | | 24.2 | 32.4 | 21.8 |
| Level of Service | A | B | B | B | B | B | C | C | | C | C | C |
| Approach Delay (s) | | 12.9 | | | 12.3 | | | 26.1 | | | 29.0 | |
| Approach LOS | | B | | | B | | | C | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 19.1 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.55 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 80.7% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |

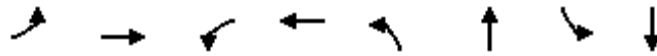
c Critical Lane Group

Timings

<Future>PM

1: Main Street & Vodden Street West/Vodden Street East

03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ |
| Traffic Volume (vph) | 44 | 298 | 169 | 427 | 85 | 972 | 162 | 585 |
| Future Volume (vph) | 44 | 298 | 169 | 427 | 85 | 972 | 162 | 585 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | pm+pt | NA |
| Protected Phases | | 4 | | 8 | | 2 | 1 | 6 |
| Permitted Phases | 4 | | 8 | | 2 | | 6 | |
| Detector Phase | 4 | 4 | 8 | 8 | 2 | 2 | 1 | 6 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 |
| Minimum Split (s) | 25.0 | 25.0 | 25.0 | 25.0 | 27.0 | 27.0 | 9.0 | 27.0 |
| Total Split (s) | 70.0 | 70.0 | 70.0 | 70.0 | 75.0 | 75.0 | 15.0 | 90.0 |
| Total Split (%) | 43.8% | 43.8% | 43.8% | 43.8% | 46.9% | 46.9% | 9.4% | 56.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 3.0 | 6.0 |
| Lead/Lag | | | | | Lag | Lag | Lead | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | C-Max | C-Max | None | C-Max |
| Act Effct Green (s) | 61.5 | 61.5 | 61.5 | 61.5 | 72.1 | 72.1 | 89.5 | 86.5 |
| Actuated g/C Ratio | 0.38 | 0.38 | 0.38 | 0.38 | 0.45 | 0.45 | 0.56 | 0.54 |
| v/c Ratio | 0.73 | 0.54 | 0.70 | 0.93 | 0.31 | 0.76 | 0.78 | 0.35 |
| Control Delay | 96.0 | 40.6 | 57.2 | 67.6 | 33.0 | 41.3 | 44.3 | 21.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 96.0 | 40.6 | 57.2 | 69.0 | 33.0 | 41.3 | 44.3 | 21.8 |
| LOS | F | D | E | E | C | D | D | C |
| Approach Delay | | 46.9 | | 66.3 | | 40.7 | | 26.6 |
| Approach LOS | | D | | E | | D | | C |

Intersection Summary

Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 79 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 44.3
 Intersection Capacity Utilization 97.5%
 Analysis Period (min) 15
 Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 1: Main Street & Vodden Street West/Vodden Street East

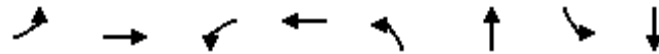


Queues

<Future>PM

1: Main Street & Vodden Street West/Vodden Street East

03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|-------|-------|-------|--------|------|-------|-------|-------|
| Lane Group Flow (vph) | 48 | 376 | 184 | 638 | 92 | 1160 | 176 | 656 |
| v/c Ratio | 0.73 | 0.54 | 0.70 | 0.93 | 0.31 | 0.76 | 0.78 | 0.35 |
| Control Delay | 96.0 | 40.6 | 57.2 | 67.6 | 33.0 | 41.3 | 44.3 | 21.8 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 96.0 | 40.6 | 57.2 | 69.0 | 33.0 | 41.3 | 44.3 | 21.8 |
| Queue Length 50th (m) | 12.6 | 88.9 | 47.9 | 185.9 | 19.2 | 165.8 | 27.6 | 62.6 |
| Queue Length 95th (m) | #37.8 | 120.8 | 80.4 | #258.8 | 34.8 | 194.4 | #58.6 | 76.6 |
| Internal Link Dist (m) | | 98.5 | | 228.5 | | 261.4 | | 232.7 |
| Turn Bay Length (m) | 42.0 | | 100.0 | | 48.5 | | 22.5 | |
| Base Capacity (vph) | 69 | 721 | 272 | 710 | 298 | 1522 | 232 | 1877 |
| Starvation Cap Reductn | 0 | 0 | 0 | 16 | 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 | 0.70 | 0.52 | 0.68 | 0.92 | 0.31 | 0.76 | 0.76 | 0.35 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 1: Main Street & Vodden Street West/Vodden Street East

<Future>PM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|------|-------|------|------|------|------|-------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 44 | 298 | 48 | 169 | 427 | 160 | 85 | 972 | 95 | 162 | 585 | 18 |
| Future Volume (vph) | 44 | 298 | 48 | 169 | 427 | 160 | 85 | 972 | 95 | 162 | 585 | 18 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.97 | | 1.00 | 0.96 | | 1.00 | 0.98 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.91 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.98 | | 1.00 | 0.96 | | 1.00 | 0.99 | | 1.00 | 1.00 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1785 | 1795 | | 1785 | 1756 | | 1564 | 3366 | | 1785 | 3473 | |
| Flt Permitted | 0.09 | 1.00 | | 0.36 | 1.00 | | 0.40 | 1.00 | | 0.11 | 1.00 | |
| Satd. Flow (perm) | 173 | 1795 | | 682 | 1756 | | 662 | 3366 | | 202 | 3473 | |
| 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) | 48 | 324 | 52 | 184 | 464 | 174 | 92 | 1057 | 103 | 176 | 636 | 20 |
| RTOR Reduction (vph) | 0 | 4 | 0 | 0 | 9 | 0 | 0 | 4 | 0 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 48 | 372 | 0 | 184 | 629 | 0 | 92 | 1156 | 0 | 176 | 655 | 0 |
| Confl. Peds. (#/hr) | 47 | | 71 | 71 | | 47 | 58 | | 62 | 62 | | 58 |
| Heavy Vehicles (%) | 0% | 1% | 3% | 0% | 1% | 2% | 4% | 3% | 0% | 0% | 4% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | pm+pt | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Actuated Green, G (s) | 61.5 | 61.5 | | 61.5 | 61.5 | | 72.2 | 72.2 | | 86.5 | 86.5 | |
| Effective Green, g (s) | 61.5 | 61.5 | | 61.5 | 61.5 | | 72.2 | 72.2 | | 86.5 | 86.5 | |
| Actuated g/C Ratio | 0.38 | 0.38 | | 0.38 | 0.38 | | 0.45 | 0.45 | | 0.54 | 0.54 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 3.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 66 | 689 | | 262 | 674 | | 298 | 1518 | | 221 | 1877 | |
| v/s Ratio Prot | | 0.21 | | | c0.36 | | | 0.34 | | c0.06 | 0.19 | |
| v/s Ratio Perm | 0.28 | | | 0.27 | | | 0.14 | | | c0.37 | | |
| v/c Ratio | 0.73 | 0.54 | | 0.70 | 0.93 | | 0.31 | 0.76 | | 0.80 | 0.35 | |
| Uniform Delay, d1 | 42.1 | 38.3 | | 41.5 | 47.3 | | 28.0 | 36.7 | | 27.7 | 20.8 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 38.7 | 1.5 | | 10.2 | 20.7 | | 2.7 | 3.7 | | 17.8 | 0.5 | |
| Delay (s) | 80.8 | 39.8 | | 51.8 | 68.0 | | 30.7 | 40.4 | | 45.5 | 21.3 | |
| Level of Service | F | D | | D | E | | C | D | | D | C | |
| Approach Delay (s) | | 44.4 | | | 64.3 | | | 39.6 | | | 26.4 | |
| Approach LOS | | D | | | E | | | D | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 43.0 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 0.87 | | |
| Actuated Cycle Length (s) | 160.0 | Sum of lost time (s) | 15.0 |
| Intersection Capacity Utilization | 97.5% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

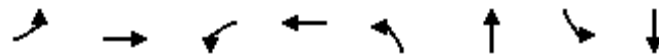
c Critical Lane Group

Timings

<Future>PM

2: Ken Whillans Drive/Private Access & Vodden Street East

03-12-2020



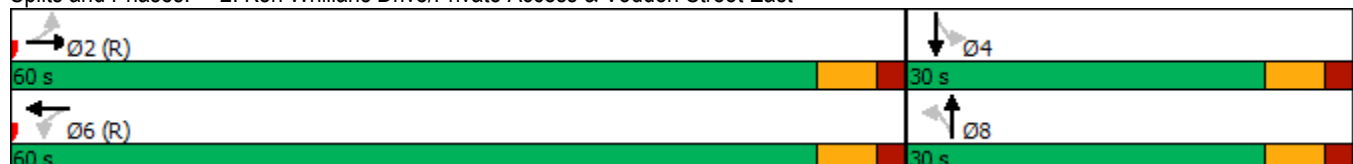
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↶ | ↷ | ↶ | ↷ | ↶ | ↷ | | ↶↷ |
| Traffic Volume (vph) | 44 | 554 | 49 | 878 | 64 | 2 | 32 | 3 |
| Future Volume (vph) | 44 | 554 | 49 | 878 | 64 | 2 | 32 | 3 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 2 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 26.0 | 26.0 | 26.0 | 26.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 60.0 | 60.0 | 60.0 | 60.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 66.7% | 66.7% | 66.7% | 66.7% | 33.3% | 33.3% | 33.3% | 33.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 69.7 | 69.7 | 69.7 | 69.7 | 12.3 | 12.3 | | 12.3 |
| Actuated g/C Ratio | 0.77 | 0.77 | 0.77 | 0.77 | 0.14 | 0.14 | | 0.14 |
| v/c Ratio | 0.16 | 0.46 | 0.10 | 0.68 | 0.40 | 0.25 | | 0.22 |
| Control Delay | 6.1 | 6.4 | 2.0 | 3.6 | 41.2 | 11.4 | | 18.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | 6.1 | 6.4 | 2.0 | 3.6 | 41.2 | 11.4 | | 18.0 |
| LOS | A | A | A | A | D | B | | B |
| Approach Delay | | 6.4 | | 3.5 | | 26.4 | | 18.0 |
| Approach LOS | | A | | A | | C | | B |

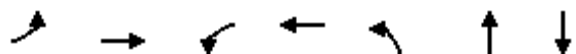
Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 35 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 6.8
 Intersection Capacity Utilization 70.9%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service C

Splits and Phases: 2: Ken Whillans Drive/Private Access & Vodden Street East





| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|-------|-------|------|------|------|
| Lane Group Flow (vph) | 48 | 660 | 53 | 987 | 70 | 69 | 88 |
| v/c Ratio | 0.16 | 0.46 | 0.10 | 0.68 | 0.40 | 0.25 | 0.22 |
| Control Delay | 6.1 | 6.4 | 2.0 | 3.6 | 41.2 | 11.4 | 18.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 6.1 | 6.4 | 2.0 | 3.6 | 41.2 | 11.4 | 18.0 |
| Queue Length 50th (m) | 2.1 | 38.9 | 0.7 | 13.0 | 11.2 | 0.3 | 3.1 |
| Queue Length 95th (m) | 7.2 | 72.6 | m1.4 | m20.5 | 22.5 | 10.9 | 9.1 |
| Internal Link Dist (m) | | 228.5 | | 397.8 | | 93.7 | 45.6 |
| Turn Bay Length (m) | 100.0 | | 100.0 | | 29.0 | | |
| Base Capacity (vph) | 301 | 1426 | 518 | 1453 | 343 | 473 | 738 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.16 | 0.46 | 0.10 | 0.68 | 0.20 | 0.15 | 0.12 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
 2: Ken Whillans Drive/Private Access & Vodden Street East

<Future>PM
 03-12-2020

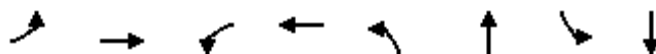


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|-------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | | ↕ | ↘ |
| Traffic Volume (vph) | 44 | 554 | 53 | 49 | 878 | 30 | 64 | 2 | 62 | 32 | 3 | 46 |
| Future Volume (vph) | 44 | 554 | 53 | 49 | 878 | 30 | 64 | 2 | 62 | 32 | 3 | 46 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 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 | | | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.97 | | | 0.96 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 0.99 | 1.00 | | 0.96 | 1.00 | | | 1.00 | |
| Fr _t | 1.00 | 0.99 | | 1.00 | 0.99 | | 1.00 | 0.85 | | | 0.91 | |
| Fl _t Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | | 0.98 | |
| Satd. Flow (prot) | 1785 | 1839 | | 1715 | 1875 | | 1756 | 1593 | | | 3146 | |
| Fl _t Permitted | 0.21 | 1.00 | | 0.37 | 1.00 | | 0.70 | 1.00 | | | 0.82 | |
| Satd. Flow (perm) | 389 | 1839 | | 668 | 1875 | | 1288 | 1593 | | | 2632 | |
| 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) | 48 | 602 | 58 | 53 | 954 | 33 | 70 | 2 | 67 | 35 | 3 | 50 |
| RTOR Reduction (vph) | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 59 | 0 | 0 | 44 | 0 |
| Lane Group Flow (vph) | 48 | 657 | 0 | 53 | 986 | 0 | 70 | 10 | 0 | 0 | 44 | 0 |
| Confl. Peds. (#/hr) | 12 | | 14 | 14 | | 12 | 20 | | 5 | 5 | | 20 |
| Heavy Vehicles (%) | 0% | 2% | 0% | 3% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 8 | | | | 4 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 67.3 | 67.3 | | 67.3 | 67.3 | | 10.7 | 10.7 | | | 10.7 | |
| Effective Green, g (s) | 67.3 | 67.3 | | 67.3 | 67.3 | | 10.7 | 10.7 | | | 10.7 | |
| Actuated g/C Ratio | 0.75 | 0.75 | | 0.75 | 0.75 | | 0.12 | 0.12 | | | 0.12 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | 290 | 1375 | | 499 | 1402 | | 153 | 189 | | | 312 | |
| v/s Ratio Prot | | 0.36 | | | c0.53 | | | 0.01 | | | | |
| v/s Ratio Perm | 0.12 | | | 0.08 | | | c0.05 | | | | 0.02 | |
| v/c Ratio | 0.17 | 0.48 | | 0.11 | 0.70 | | 0.46 | 0.05 | | | 0.14 | |
| Uniform Delay, d1 | 3.3 | 4.5 | | 3.1 | 6.0 | | 36.9 | 35.2 | | | 35.5 | |
| Progression Factor | 1.00 | 1.00 | | 0.40 | 0.30 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | 1.2 | 1.2 | | 0.2 | 1.5 | | 4.5 | 0.2 | | | 0.4 | |
| Delay (s) | 4.5 | 5.6 | | 1.5 | 3.3 | | 41.4 | 35.4 | | | 36.0 | |
| Level of Service | A | A | | A | A | | D | D | | | D | |
| Approach Delay (s) | | 5.6 | | | 3.2 | | | 38.4 | | | 36.0 | |
| Approach LOS | | A | | | A | | | D | | | D | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 8.0 | | | | | | | | | A |
| HCM 2000 Volume to Capacity ratio | | | 0.67 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | | | | 12.0 | | |
| Intersection Capacity Utilization | | | 70.9% | | | | | | | | | C |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
3: Centre Street North & Vodden Street East

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↗ | ↖ | ↗ | ↖ | ↕ |
| Traffic Volume (vph) | 146 | 508 | 60 | 762 | 122 | 358 | 40 | 143 |
| Future Volume (vph) | 146 | 508 | 60 | 762 | 122 | 358 | 40 | 143 |
| Turn Type | pm+pt | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | 5 | 2 | | 6 | | 8 | | 4 |
| Permitted Phases | 2 | | 6 | | 8 | | 4 | |
| Detector Phase | 5 | 2 | 6 | 6 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 5.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 9.5 | 28.0 | 28.0 | 28.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| Total Split (s) | 9.5 | 61.0 | 51.5 | 51.5 | 29.0 | 29.0 | 29.0 | 29.0 |
| Total Split (%) | 10.6% | 67.8% | 57.2% | 57.2% | 32.2% | 32.2% | 32.2% | 32.2% |
| Yellow Time (s) | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 0.0 | 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) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lead | | Lag | Lag | | | | |
| Lead-Lag Optimize? | Yes | | Yes | Yes | | | | |
| Recall Mode | None | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 58.0 | 55.0 | 45.5 | 45.5 | 23.0 | 23.0 | 23.0 | 23.0 |
| Actuated g/C Ratio | 0.64 | 0.61 | 0.51 | 0.51 | 0.26 | 0.26 | 0.26 | 0.26 |
| v/c Ratio | 0.73 | 0.56 | 0.18 | 0.99 | 0.49 | 0.99 | 0.52 | 0.30 |
| Control Delay | 31.4 | 15.5 | 9.5 | 45.5 | 35.6 | 73.1 | 54.0 | 15.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 31.4 | 15.5 | 9.5 | 47.5 | 35.6 | 73.1 | 54.0 | 15.5 |
| LOS | C | B | A | D | D | E | D | B |
| Approach Delay | | 18.7 | | 45.0 | | 64.9 | | 20.6 |
| Approach LOS | | B | | D | | E | | C |

Intersection Summary

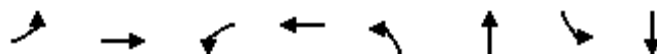
Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.99
 Intersection Signal Delay: 38.8
 Intersection LOS: D
 Intersection Capacity Utilization 102.8%
 ICU Level of Service G
 Analysis Period (min) 15

Splits and Phases: 3: Centre Street North & Vodden Street East



Queues
3: Centre Street North & Vodden Street East

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|-------|-------|------|--------|------|--------|-------|-------|
| Lane Group Flow (vph) | 159 | 640 | 65 | 933 | 133 | 475 | 43 | 282 |
| v/c Ratio | 0.73 | 0.56 | 0.18 | 0.99 | 0.49 | 0.99 | 0.52 | 0.30 |
| Control Delay | 31.4 | 15.5 | 9.5 | 45.5 | 35.6 | 73.1 | 54.0 | 15.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 31.4 | 15.5 | 9.5 | 47.5 | 35.6 | 73.1 | 54.0 | 15.5 |
| Queue Length 50th (m) | 14.6 | 80.9 | 5.8 | 151.2 | 19.6 | 80.1 | 6.4 | 11.0 |
| Queue Length 95th (m) | #39.2 | 112.7 | m6.4 | #239.2 | 37.3 | #141.9 | #21.2 | 21.0 |
| Internal Link Dist (m) | | 397.8 | | 166.8 | | 100.6 | | 129.3 |
| Turn Bay Length (m) | 47.0 | | 59.5 | | 44.0 | | 35.5 | |
| Base Capacity (vph) | 217 | 1133 | 365 | 940 | 274 | 480 | 83 | 954 |
| Starvation Cap Reductn | 0 | 0 | 0 | 8 | 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 | 0.73 | 0.56 | 0.18 | 1.00 | 0.49 | 0.99 | 0.52 | 0.30 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

3: Centre Street North & Vodden Street East

<Future>PM

03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---------------------------|-------|------|------|------|-------|------|------|-------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 146 | 508 | 81 | 60 | 762 | 97 | 122 | 358 | 79 | 40 | 143 | 117 |
| Future Volume (vph) | 146 | 508 | 81 | 60 | 762 | 97 | 122 | 358 | 79 | 40 | 143 | 117 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 3.0 | 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 | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Fr _t | 1.00 | 0.98 | | 1.00 | 0.98 | | 1.00 | 0.97 | | 1.00 | 0.93 | |
| Fl _t Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1785 | 1846 | | 1780 | 1851 | | 1767 | 1844 | | 1781 | 3367 | |
| Fl _t Permitted | 0.08 | 1.00 | | 0.39 | 1.00 | | 0.58 | 1.00 | | 0.17 | 1.00 | |
| Satd. Flow (perm) | 155 | 1846 | | 724 | 1851 | | 1076 | 1844 | | 326 | 3367 | |
| 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) | 159 | 552 | 88 | 65 | 828 | 105 | 133 | 389 | 86 | 43 | 155 | 127 |
| RTOR Reduction (vph) | 0 | 6 | 0 | 0 | 5 | 0 | 0 | 9 | 0 | 0 | 95 | 0 |
| Lane Group Flow (vph) | 159 | 634 | 0 | 65 | 928 | 0 | 133 | 466 | 0 | 43 | 187 | 0 |
| Confl. Peds. (#/hr) | 4 | | 6 | 6 | | 4 | | | 4 | 4 | | |
| Heavy Vehicles (%) | 0% | 1% | 0% | 0% | 1% | 0% | 1% | 1% | 0% | 0% | 2% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | pm+pt | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | 5 | 2 | | | 6 | | | 8 | | | | 4 |
| Permitted Phases | 2 | | | 6 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 55.0 | 55.0 | | 45.5 | 45.5 | | 23.0 | 23.0 | | 23.0 | 23.0 | |
| Effective Green, g (s) | 55.0 | 55.0 | | 45.5 | 45.5 | | 23.0 | 23.0 | | 23.0 | 23.0 | |
| Actuated g/C Ratio | 0.61 | 0.61 | | 0.51 | 0.51 | | 0.26 | 0.26 | | 0.26 | 0.26 | |
| Clearance Time (s) | 3.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 3.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 212 | 1128 | | 366 | 935 | | 274 | 471 | | 83 | 860 | |
| v/s Ratio Prot | c0.05 | 0.34 | | | c0.50 | | | c0.25 | | | 0.06 | |
| v/s Ratio Perm | 0.40 | | | 0.09 | | | 0.12 | | | 0.13 | | |
| v/c Ratio | 0.75 | 0.56 | | 0.18 | 0.99 | | 0.49 | 0.99 | | 0.52 | 0.22 | |
| Uniform Delay, d1 | 20.0 | 10.4 | | 12.1 | 22.1 | | 28.5 | 33.4 | | 28.7 | 26.4 | |
| Progression Factor | 0.85 | 1.29 | | 0.68 | 0.86 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 13.2 | 1.9 | | 0.9 | 24.7 | | 2.8 | 38.5 | | 10.5 | 0.3 | |
| Delay (s) | 30.2 | 15.3 | | 9.1 | 43.7 | | 31.3 | 71.9 | | 39.2 | 26.7 | |
| Level of Service | C | B | | A | D | | C | E | | D | C | |
| Approach Delay (s) | | 18.3 | | | 41.5 | | | 63.0 | | | 28.3 | |
| Approach LOS | | B | | | D | | | E | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|--------|---------------------------|------|
| HCM 2000 Control Delay | 37.9 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 0.97 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 15.0 |
| Intersection Capacity Utilization | 102.8% | ICU Level of Service | G |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
7: Rutherford Road North & Vodden Street East

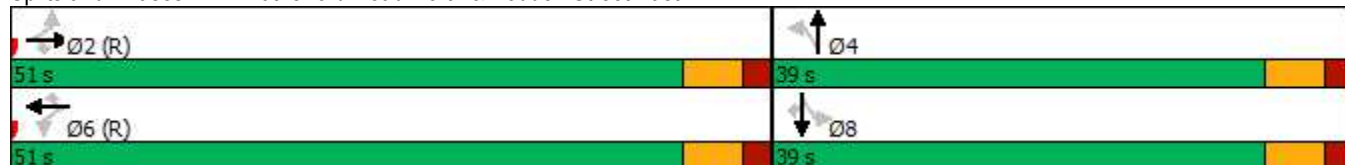
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| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | | | | | | | |
| Traffic Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 69 | 173 | 82 |
| Future Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 69 | 173 | 82 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | 8 | | 8 |
| Detector Phase | 2 | 2 | 2 | 6 | 6 | 6 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 51.0 | 51.0 | 51.0 | 51.0 | 51.0 | 51.0 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 |
| Total Split (%) | 56.7% | 56.7% | 56.7% | 56.7% | 56.7% | 56.7% | 43.3% | 43.3% | 43.3% | 43.3% | 43.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 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 | 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 | 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 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 31.1 | 31.1 | 31.1 | 31.1 | 31.1 |
| Actuated g/C Ratio | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| v/c Ratio | 0.63 | 0.50 | 0.11 | 0.19 | 0.62 | 0.18 | 0.40 | 0.86 | 0.66 | 0.27 | 0.14 |
| Control Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| LOS | C | B | A | B | C | A | C | D | E | C | A |
| Approach Delay | | 16.5 | | | 18.0 | | | 37.5 | | 25.1 | |
| Approach LOS | | B | | | B | | | D | | C | |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 23.8
 Intersection Capacity Utilization 97.7%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service F

Splits and Phases: 7: Rutherford Road North & Vodden Street East



Queues
7: Rutherford Road North & Vodden Street East

<Future>PM
06-01-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|------------------------|-------|-------|------|------|-------|------|------|--------|-------|-------|------|
| Lane Group Flow (vph) | 175 | 488 | 93 | 69 | 610 | 155 | 167 | 550 | 70 | 175 | 83 |
| v/c Ratio | 0.63 | 0.50 | 0.11 | 0.19 | 0.62 | 0.18 | 0.40 | 0.86 | 0.66 | 0.27 | 0.14 |
| Control Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| Queue Length 50th (m) | 24.6 | 64.0 | 3.8 | 6.3 | 74.3 | 0.4 | 20.9 | 82.5 | 9.8 | 20.8 | 0.0 |
| Queue Length 95th (m) | #54.2 | 99.0 | m5.7 | 17.3 | 132.0 | 15.8 | 37.7 | #135.1 | #30.7 | 35.8 | 8.7 |
| Internal Link Dist (m) | | 358.4 | | | 418.5 | | | 288.8 | | 340.1 | |
| Turn Bay Length (m) | 50.0 | | 50.0 | 48.5 | | 48.5 | 47.5 | | 41.5 | | 44.5 |
| Base Capacity (vph) | 278 | 973 | 815 | 370 | 983 | 872 | 440 | 678 | 112 | 684 | 614 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.63 | 0.50 | 0.11 | 0.19 | 0.62 | 0.18 | 0.38 | 0.81 | 0.63 | 0.26 | 0.14 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

7: Rutherford Road North & Vodden Street East

<Future>PM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|------|------|------|------|------|------|-------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ | ↖ | ↗ | | ↖ | ↗ | ↘ |
| Traffic Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 97 | 69 | 173 | 82 |
| Future Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 97 | 69 | 173 | 82 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 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 | | 1.00 | 1.00 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.97 | 1.00 | 0.99 | | 1.00 | 1.00 | 0.98 |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 0.99 | 1.00 | 1.00 | 1.00 | 1.00 | | 0.99 | 1.00 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1781 | 1868 | 1479 | 1765 | 1887 | 1537 | 1783 | 1828 | | 1776 | 1868 | 1532 |
| Flt Permitted | 0.28 | 1.00 | 1.00 | 0.38 | 1.00 | 1.00 | 0.64 | 1.00 | | 0.16 | 1.00 | 1.00 |
| Satd. Flow (perm) | 534 | 1868 | 1479 | 709 | 1887 | 1537 | 1200 | 1828 | | 308 | 1868 | 1532 |
| Peak-hour factor, PHF | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Adj. Flow (vph) | 175 | 488 | 93 | 69 | 610 | 155 | 167 | 452 | 98 | 70 | 175 | 83 |
| RTOR Reduction (vph) | 0 | 0 | 45 | 0 | 0 | 72 | 0 | 9 | 0 | 0 | 0 | 54 |
| Lane Group Flow (vph) | 175 | 488 | 48 | 69 | 610 | 83 | 167 | 541 | 0 | 70 | 175 | 29 |
| Confl. Peds. (#/hr) | 5 | | 18 | 18 | | 5 | 1 | | 11 | 11 | | 1 |
| Confl. Bikes (#/hr) | | | | | | 1 | | | | | | |
| Heavy Vehicles (%) | 0% | 2% | 3% | 0% | 1% | 1% | 0% | 1% | 0% | 0% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 31.1 | 31.1 | | 31.1 | 31.1 | 31.1 |
| Effective Green, g (s) | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 31.1 | 31.1 | | 31.1 | 31.1 | 31.1 |
| Actuated g/C Ratio | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.35 | 0.35 | | 0.35 | 0.35 | 0.35 |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 278 | 973 | 770 | 369 | 983 | 800 | 414 | 631 | | 106 | 645 | 529 |
| v/s Ratio Prot | | 0.26 | | | 0.32 | | | c0.30 | | | 0.09 | |
| v/s Ratio Perm | c0.33 | | 0.03 | 0.10 | | 0.05 | 0.14 | | | 0.23 | | 0.02 |
| v/c Ratio | 0.63 | 0.50 | 0.06 | 0.19 | 0.62 | 0.10 | 0.40 | 0.86 | | 0.66 | 0.27 | 0.05 |
| Uniform Delay, d1 | 15.4 | 14.0 | 10.7 | 11.4 | 15.3 | 10.9 | 22.4 | 27.4 | | 25.0 | 21.3 | 19.6 |
| Progression Factor | 0.95 | 0.93 | 1.07 | 1.13 | 1.13 | 1.87 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 8.7 | 1.5 | 0.1 | 1.1 | 2.9 | 0.3 | 1.3 | 12.1 | | 18.6 | 0.5 | 0.1 |
| Delay (s) | 23.3 | 14.5 | 11.6 | 14.0 | 20.2 | 20.7 | 23.7 | 39.5 | | 43.6 | 21.7 | 19.7 |
| Level of Service | C | B | B | B | C | C | C | D | | D | C | B |
| Approach Delay (s) | | 16.2 | | | 19.8 | | | 35.8 | | | 25.9 | |
| Approach LOS | | B | | | B | | | D | | | C | |

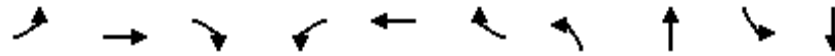
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 23.9 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.72 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 97.7% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
5: Kennedy Road North & Vodden Street East

<Future>PM
03-12-2020



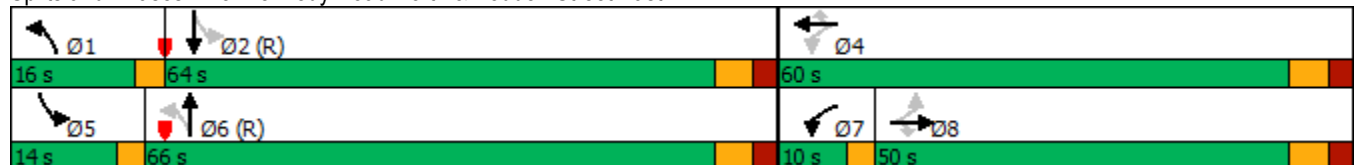
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ | ↖ | ↕ | ↖ | ↗ |
| Traffic Volume (vph) | 67 | 427 | 103 | 121 | 550 | 256 | 172 | 1136 | 137 | 641 |
| Future Volume (vph) | 67 | 427 | 103 | 121 | 550 | 256 | 172 | 1136 | 137 | 641 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | pm+pt | NA |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | 5 | 2 |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | 2 | |
| Detector Phase | 8 | 8 | 8 | 7 | 4 | 4 | 1 | 6 | 5 | 2 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 5.0 | 8.0 | 8.0 | 5.0 | 8.0 | 5.0 | 8.0 |
| Minimum Split (s) | 40.8 | 40.8 | 40.8 | 8.0 | 40.8 | 40.8 | 8.0 | 39.7 | 8.0 | 39.7 |
| Total Split (s) | 50.0 | 50.0 | 50.0 | 10.0 | 60.0 | 60.0 | 16.0 | 66.0 | 14.0 | 64.0 |
| Total Split (%) | 35.7% | 35.7% | 35.7% | 7.1% | 42.9% | 42.9% | 11.4% | 47.1% | 10.0% | 45.7% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 3.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 2.8 | 0.0 | 2.8 | 2.8 | 0.0 | 2.7 | 0.0 | 2.7 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.7 | 3.0 | 6.7 |
| Lead/Lag | Lag | Lag | Lag | Lead | | | Lead | Lag | Lead | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | | | Yes | Yes | Yes | Yes |
| Recall Mode | None | None | None | None | None | None | None | C-Max | None | C-Max |
| Act Effct Green (s) | 38.5 | 38.5 | 38.5 | 52.3 | 48.5 | 48.5 | 79.9 | 64.9 | 77.4 | 63.6 |
| Actuated g/C Ratio | 0.28 | 0.28 | 0.28 | 0.37 | 0.35 | 0.35 | 0.57 | 0.46 | 0.55 | 0.45 |
| v/c Ratio | 0.87 | 0.84 | 0.23 | 0.71 | 0.86 | 0.44 | 0.44 | 0.78 | 0.66 | 0.46 |
| Control Delay | 120.3 | 62.6 | 13.7 | 51.7 | 56.2 | 18.6 | 18.0 | 36.5 | 34.6 | 28.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 120.3 | 62.6 | 13.7 | 51.7 | 57.2 | 18.6 | 18.0 | 36.5 | 34.6 | 28.3 |
| LOS | F | E | B | D | E | B | B | D | C | C |
| Approach Delay | | 60.6 | | | 45.8 | | | 34.3 | | 29.3 |
| Approach LOS | | E | | | D | | | C | | C |

Intersection Summary

Cycle Length: 140
 Actuated Cycle Length: 140
 Offset: 42 (30%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 40.2
 Intersection Capacity Utilization 98.1%
 Analysis Period (min) 15

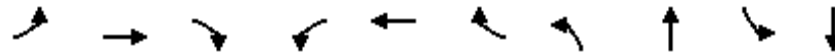
Intersection LOS: D
 ICU Level of Service F

Splits and Phases: 5: Kennedy Road North & Vodden Street East



Queues
5: Kennedy Road North & Vodden Street East

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|-------|-------|------|-------|-------|------|------|-------|------|-------|
| Lane Group Flow (vph) | 69 | 440 | 106 | 125 | 567 | 264 | 177 | 1269 | 141 | 723 |
| v/c Ratio | 0.87 | 0.84 | 0.23 | 0.71 | 0.86 | 0.44 | 0.44 | 0.78 | 0.66 | 0.46 |
| Control Delay | 120.3 | 62.6 | 13.7 | 51.7 | 56.2 | 18.6 | 18.0 | 36.5 | 34.6 | 28.3 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 120.3 | 62.6 | 13.7 | 51.7 | 57.2 | 18.6 | 18.0 | 36.5 | 34.6 | 28.3 |
| Queue Length 50th (m) | 17.9 | 112.9 | 6.0 | 22.6 | 142.3 | 26.6 | 22.6 | 158.1 | 17.6 | 73.5 |
| Queue Length 95th (m) | #45.8 | 149.9 | 19.9 | #38.9 | 184.4 | 49.4 | 36.6 | 194.1 | 37.9 | 95.4 |
| Internal Link Dist (m) | | 488.5 | | | 191.2 | | | 129.6 | | 496.7 |
| Turn Bay Length (m) | 52.0 | | 52.0 | 43.5 | | 43.5 | 58.0 | | 79.5 | |
| Base Capacity (vph) | 88 | 586 | 518 | 177 | 722 | 652 | 422 | 1633 | 225 | 1577 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.78 | 0.75 | 0.20 | 0.71 | 0.83 | 0.40 | 0.42 | 0.78 | 0.63 | 0.46 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

5: Kennedy Road North & Vodden Street East

<Future>PM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|------|------|-------|-------|------|-------|-------|------|-------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 67 | 427 | 103 | 121 | 550 | 256 | 172 | 1136 | 95 | 137 | 641 | 60 |
| Future Volume (vph) | 67 | 427 | 103 | 121 | 550 | 256 | 172 | 1136 | 95 | 137 | 641 | 60 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frbp, ped/bikes | 1.00 | 1.00 | 0.96 | 1.00 | 1.00 | 0.94 | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 0.99 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1761 | 1902 | 1511 | 1748 | 1902 | 1503 | 1761 | 3513 | | 1785 | 3462 | |
| Flt Permitted | 0.16 | 1.00 | 1.00 | 0.15 | 1.00 | 1.00 | 0.29 | 1.00 | | 0.09 | 1.00 | |
| Satd. Flow (perm) | 287 | 1902 | 1511 | 280 | 1902 | 1503 | 537 | 3513 | | 177 | 3462 | |
| Peak-hour factor, PHF | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Adj. Flow (vph) | 69 | 440 | 106 | 125 | 567 | 264 | 177 | 1171 | 98 | 141 | 661 | 62 |
| RTOR Reduction (vph) | 0 | 0 | 55 | 0 | 0 | 85 | 0 | 4 | 0 | 0 | 4 | 0 |
| Lane Group Flow (vph) | 69 | 440 | 51 | 125 | 567 | 179 | 177 | 1265 | 0 | 141 | 719 | 0 |
| Confl. Peds. (#/hr) | 38 | | 27 | 27 | | 38 | 23 | | 28 | 28 | | 23 |
| Confl. Bikes (#/hr) | | | | | | 1 | | | | | | |
| Heavy Vehicles (%) | 0% | 1% | 1% | 2% | 1% | 0% | 1% | 2% | 3% | 0% | 2% | 0% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | | pm+pt | NA | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | 5 | 2 | |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | | 2 | | |
| Actuated Green, G (s) | 38.5 | 38.5 | 38.5 | 48.5 | 48.5 | 48.5 | 76.3 | 65.0 | | 73.7 | 63.7 | |
| Effective Green, g (s) | 38.5 | 38.5 | 38.5 | 48.5 | 48.5 | 48.5 | 76.3 | 65.0 | | 73.7 | 63.7 | |
| Actuated g/C Ratio | 0.28 | 0.28 | 0.28 | 0.35 | 0.35 | 0.35 | 0.54 | 0.46 | | 0.53 | 0.46 | |
| Clearance Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.7 | | 3.0 | 6.7 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 3.0 | 5.0 | 5.0 | 3.0 | 5.0 | | 3.0 | 5.0 | |
| Lane Grp Cap (vph) | 78 | 523 | 415 | 170 | 658 | 520 | 391 | 1631 | | 208 | 1575 | |
| v/s Ratio Prot | | 0.23 | | 0.04 | c0.30 | | c0.04 | c0.36 | | c0.05 | 0.21 | |
| v/s Ratio Perm | 0.24 | | 0.03 | 0.22 | | 0.12 | 0.21 | | | 0.31 | | |
| v/c Ratio | 0.88 | 0.84 | 0.12 | 0.74 | 0.86 | 0.34 | 0.45 | 0.78 | | 0.68 | 0.46 | |
| Uniform Delay, d1 | 48.6 | 47.9 | 38.1 | 35.8 | 42.6 | 34.0 | 17.2 | 31.4 | | 24.2 | 26.2 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 67.4 | 12.8 | 0.3 | 15.2 | 12.1 | 0.8 | 0.8 | 3.7 | | 8.5 | 1.0 | |
| Delay (s) | 116.0 | 60.7 | 38.4 | 51.0 | 54.8 | 34.8 | 18.0 | 35.1 | | 32.6 | 27.2 | |
| Level of Service | F | E | D | D | D | C | B | D | | C | C | |
| Approach Delay (s) | | 63.0 | | | 48.8 | | | 33.0 | | | 28.1 | |
| Approach LOS | | E | | | D | | | C | | | C | |

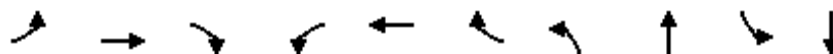
Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 40.5 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 0.82 | | |
| Actuated Cycle Length (s) | 140.0 | Sum of lost time (s) | 19.5 |
| Intersection Capacity Utilization | 98.1% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
6: Hansen Road North & Vodden Street East

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | | | | | | |
| Traffic Volume (vph) | 63 | 627 | 64 | 109 | 822 | 109 | 213 | 172 | 43 | 53 |
| Future Volume (vph) | 63 | 627 | 64 | 109 | 822 | 109 | 213 | 172 | 43 | 53 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | | 2 | | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | 2 | | 2 | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 55.0 | 55.0 | 55.0 | 55.0 | 55.0 | 55.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (%) | 61.1% | 61.1% | 61.1% | 61.1% | 61.1% | 61.1% | 38.9% | 38.9% | 38.9% | 38.9% |
| Yellow Time (s) | 4.0 | 4.0 | 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 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 54.1 | 54.1 | 54.1 | 54.1 | 54.1 | 54.1 | 23.9 | 23.9 | 23.9 | 23.9 |
| Actuated g/C Ratio | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.27 | 0.27 | 0.27 | 0.27 |
| v/c Ratio | 0.40 | 0.60 | 0.07 | 0.37 | 0.79 | 0.13 | 0.71 | 0.66 | 0.27 | 0.20 |
| Control Delay | 21.1 | 15.2 | 4.8 | 12.1 | 19.6 | 2.7 | 41.4 | 31.1 | 28.2 | 15.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 21.1 | 15.2 | 4.8 | 12.1 | 19.6 | 2.7 | 41.4 | 31.1 | 28.2 | 15.5 |
| LOS | C | B | A | B | B | A | D | C | C | B |
| Approach Delay | | 14.8 | | | 17.0 | | | 35.4 | | 19.6 |
| Approach LOS | | B | | | B | | | D | | B |

Intersection Summary

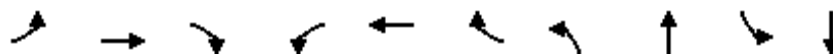
Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 37 (41%), Referenced to phase 2:EBWB, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 20.4
 Intersection Capacity Utilization 100.1%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service G

Splits and Phases: 6: Hansen Road North & Vodden Street East



Queues
6: Hansen Road North & Vodden Street East

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|------|-------|------|---------|--------|------|------|------|------|------|
| Lane Group Flow (vph) | 68 | 682 | 70 | 118 | 893 | 118 | 232 | 330 | 47 | 99 |
| v/c Ratio | 0.40 | 0.60 | 0.07 | 0.37 | 0.79 | 0.13 | 0.71 | 0.66 | 0.27 | 0.20 |
| Control Delay | 21.1 | 15.2 | 4.8 | 12.1 | 19.6 | 2.7 | 41.4 | 31.1 | 28.2 | 15.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 21.1 | 15.2 | 4.8 | 12.1 | 19.6 | 2.7 | 41.4 | 31.1 | 28.2 | 15.5 |
| Queue Length 50th (m) | 6.0 | 70.6 | 1.7 | 7.8 | 130.8 | 0.9 | 35.3 | 42.7 | 6.3 | 7.4 |
| Queue Length 95th (m) | 20.4 | 115.8 | 7.6 | m25.6 m | #205.4 | m6.9 | 57.0 | 65.9 | 14.7 | 18.0 |
| Internal Link Dist (m) | | 191.2 | | | 358.4 | | | 69.3 | | 49.9 |
| Turn Bay Length (m) | 28.0 | | 30.0 | 43.0 | | 30.0 | 34.5 | | 24.0 | |
| Base Capacity (vph) | 168 | 1142 | 941 | 321 | 1133 | 923 | 396 | 597 | 212 | 578 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.40 | 0.60 | 0.07 | 0.37 | 0.79 | 0.13 | 0.59 | 0.55 | 0.22 | 0.17 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

6: Hansen Road North & Vodden Street East

<Future>PM
03-12-2020

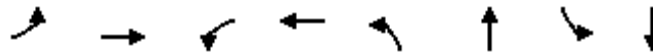


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|--------|------|-------|------|---------------------------|------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 63 | 627 | 64 | 109 | 822 | 109 | 213 | 172 | 132 | 43 | 53 | 38 |
| Future Volume (vph) | 63 | 627 | 64 | 109 | 822 | 109 | 213 | 172 | 132 | 43 | 53 | 38 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 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 | | 1.00 | 1.00 | |
| Frbp, ped/bikes | 1.00 | 1.00 | 0.96 | 1.00 | 1.00 | 0.94 | 1.00 | 0.98 | | 1.00 | 0.97 | |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.96 | 1.00 | | 0.99 | 1.00 | |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.94 | | 1.00 | 0.94 | |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1750 | 1902 | 1538 | 1776 | 1887 | 1500 | 1688 | 1759 | | 1770 | 1709 | |
| Flt Permitted | 0.15 | 1.00 | 1.00 | 0.29 | 1.00 | 1.00 | 0.69 | 1.00 | | 0.35 | 1.00 | |
| Satd. Flow (perm) | 281 | 1902 | 1538 | 536 | 1887 | 1500 | 1232 | 1759 | | 659 | 1709 | |
| 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 | 682 | 70 | 118 | 893 | 118 | 232 | 187 | 143 | 47 | 58 | 41 |
| RTOR Reduction (vph) | 0 | 0 | 18 | 0 | 0 | 23 | 0 | 33 | 0 | 0 | 30 | 0 |
| Lane Group Flow (vph) | 68 | 682 | 52 | 118 | 893 | 95 | 232 | 297 | 0 | 47 | 69 | 0 |
| Confl. Peds. (#/hr) | 27 | | 11 | 11 | | 27 | 33 | | 10 | 10 | | 33 |
| Heavy Vehicles (%) | 2% | 1% | 0% | 0% | 1% | 0% | 1% | 1% | 0% | 0% | 4% | 0% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | 2 | 2 | | 2 | 4 | | | 4 | | |
| Actuated Green, G (s) | 54.1 | 54.1 | 54.1 | 54.1 | 54.1 | 54.1 | 23.9 | 23.9 | | 23.9 | 23.9 | |
| Effective Green, g (s) | 54.1 | 54.1 | 54.1 | 54.1 | 54.1 | 54.1 | 23.9 | 23.9 | | 23.9 | 23.9 | |
| Actuated g/C Ratio | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.27 | 0.27 | | 0.27 | 0.27 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 168 | 1143 | 924 | 322 | 1134 | 901 | 327 | 467 | | 175 | 453 | |
| v/s Ratio Prot | | 0.36 | | | c0.47 | | | 0.17 | | | 0.04 | |
| v/s Ratio Perm | 0.24 | | 0.03 | 0.22 | | 0.06 | c0.19 | | | 0.07 | | |
| v/c Ratio | 0.40 | 0.60 | 0.06 | 0.37 | 0.79 | 0.11 | 0.71 | 0.64 | | 0.27 | 0.15 | |
| Uniform Delay, d1 | 9.5 | 11.2 | 7.4 | 9.2 | 13.6 | 7.6 | 29.9 | 29.2 | | 26.1 | 25.3 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 0.76 | 0.86 | 0.46 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 7.1 | 2.3 | 0.1 | 3.0 | 5.3 | 0.2 | 8.6 | 3.9 | | 1.7 | 0.3 | |
| Delay (s) | 16.6 | 13.5 | 7.5 | 10.0 | 17.1 | 3.7 | 38.5 | 33.1 | | 27.9 | 25.6 | |
| Level of Service | B | B | A | B | B | A | D | C | | C | C | |
| Approach Delay (s) | | 13.2 | | | 14.9 | | | 35.3 | | | 26.3 | |
| Approach LOS | | B | | | B | | | D | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 19.3 | | | | HCM 2000 Level of Service | | | | B | |
| HCM 2000 Volume to Capacity ratio | | | 0.76 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 90.0 | | | | Sum of lost time (s) | | | | 12.0 | |
| Intersection Capacity Utilization | | | 100.1% | | | | ICU Level of Service | | | | G | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
8: Archdekin Drive & Vodden Street East

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | | | | |
| Traffic Volume (vph) | 21 | 308 | 16 | 548 | 1 | 2 | 4 | 2 |
| Future Volume (vph) | 21 | 308 | 16 | 548 | 1 | 2 | 4 | 2 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 2 | | 4 | | 4 |
| Permitted Phases | 2 | | 2 | | 4 | | 4 | |
| Detector Phase | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 23.0 | 23.0 | 23.0 | 23.0 | 31.0 | 31.0 | 31.0 | 31.0 |
| Total Split (s) | 58.0 | 58.0 | 58.0 | 58.0 | 32.0 | 32.0 | 32.0 | 32.0 |
| Total Split (%) | 64.4% | 64.4% | 64.4% | 64.4% | 35.6% | 35.6% | 35.6% | 35.6% |
| 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | None | None | None | None |
| Act Effct Green (s) | 81.7 | 81.7 | 81.7 | 81.7 | | 8.3 | | 8.3 |
| Actuated g/C Ratio | 0.91 | 0.91 | 0.91 | 0.91 | | 0.09 | | 0.09 |
| v/c Ratio | 0.03 | 0.21 | 0.02 | 0.37 | | 0.06 | | 0.05 |
| Control Delay | 2.1 | 1.9 | 2.1 | 2.6 | | 28.0 | | 34.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | | 0.0 |
| Total Delay | 2.1 | 1.9 | 2.1 | 2.6 | | 28.0 | | 34.0 |
| LOS | A | A | A | A | | C | | C |
| Approach Delay | | 1.9 | | 2.6 | | 28.0 | | 34.0 |
| Approach LOS | | A | | A | | C | | C |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 33 (37%), Referenced to phase 2:EBWB, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.37
 Intersection Signal Delay: 2.8
 Intersection Capacity Utilization 48.6%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 8: Archdekin Drive & Vodden Street East



Queues
8: Archdekin Drive & Vodden Street East

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBT | SBT |
|------------------------|-------|-------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 23 | 349 | 17 | 620 | 8 | 8 |
| v/c Ratio | 0.03 | 0.21 | 0.02 | 0.37 | 0.06 | 0.05 |
| Control Delay | 2.1 | 1.9 | 2.1 | 2.6 | 28.0 | 34.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 2.1 | 1.9 | 2.1 | 2.6 | 28.0 | 34.0 |
| Queue Length 50th (m) | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.0 |
| Queue Length 95th (m) | m1.2 | m20.1 | 1.8 | 43.3 | 4.5 | 5.0 |
| Internal Link Dist (m) | | 418.5 | | 579.8 | 115.4 | 151.2 |
| Turn Bay Length (m) | 100.0 | | 100.0 | | | |
| Base Capacity (vph) | 711 | 1693 | 880 | 1689 | 427 | 459 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.03 | 0.21 | 0.02 | 0.37 | 0.02 | 0.02 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

8: Archdekin Drive & Vodden Street East

<Future>PM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|------|-------|------|------|------|------|------|-------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 21 | 308 | 13 | 16 | 548 | 22 | 1 | 2 | 5 | 4 | 2 | 2 |
| Future Volume (vph) | 21 | 308 | 13 | 16 | 548 | 22 | 1 | 2 | 5 | 4 | 2 | 2 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 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 | |
| Frbp, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | | 0.98 | | | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | | | 1.00 | |
| Frt | 1.00 | 0.99 | | 1.00 | 0.99 | | | 0.92 | | | 0.97 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | | 0.99 | | | 0.98 | |
| Satd. Flow (prot) | 1785 | 1864 | | 1668 | 1859 | | | 1528 | | | 1805 | |
| Flt Permitted | 0.42 | 1.00 | | 0.55 | 1.00 | | | 0.95 | | | 0.86 | |
| Satd. Flow (perm) | 784 | 1864 | | 969 | 1859 | | | 1466 | | | 1585 | |
| 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) | 23 | 335 | 14 | 17 | 596 | 24 | 1 | 2 | 5 | 4 | 2 | 2 |
| RTOR Reduction (vph) | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 0 | 2 | 0 |
| Lane Group Flow (vph) | 23 | 348 | 0 | 17 | 619 | 0 | 0 | 3 | 0 | 0 | 6 | 0 |
| Confl. Peds. (#/hr) | | | | | | | | | 4 | 4 | | |
| Heavy Vehicles (%) | 0% | 1% | 16% | 7% | 2% | 0% | 0% | 0% | 20% | 0% | 0% | 0% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 2 | | | 4 | | | 4 | |
| Permitted Phases | 2 | | | 2 | | | 4 | | | 4 | | |
| Actuated Green, G (s) | 74.5 | 74.5 | | 74.5 | 74.5 | | | 3.5 | | | 3.5 | |
| Effective Green, g (s) | 74.5 | 74.5 | | 74.5 | 74.5 | | | 3.5 | | | 3.5 | |
| Actuated g/C Ratio | 0.83 | 0.83 | | 0.83 | 0.83 | | | 0.04 | | | 0.04 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | 648 | 1542 | | 802 | 1538 | | | 57 | | | 61 | |
| v/s Ratio Prot | | 0.19 | | | c0.33 | | | | | | | |
| v/s Ratio Perm | 0.03 | | | 0.02 | | | | 0.00 | | | c0.00 | |
| v/c Ratio | 0.04 | 0.23 | | 0.02 | 0.40 | | | 0.06 | | | 0.10 | |
| Uniform Delay, d1 | 1.4 | 1.6 | | 1.4 | 2.0 | | | 41.7 | | | 41.7 | |
| Progression Factor | 1.03 | 1.03 | | 1.00 | 1.00 | | | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | 0.1 | 0.2 | | 0.0 | 0.8 | | | 0.9 | | | 1.5 | |
| Delay (s) | 1.5 | 1.9 | | 1.4 | 2.8 | | | 42.5 | | | 43.2 | |
| Level of Service | A | A | | A | A | | | D | | | D | |
| Approach Delay (s) | | 1.9 | | | 2.8 | | | 42.5 | | | 43.2 | |
| Approach LOS | | A | | | A | | | D | | | D | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 3.1 | HCM 2000 Level of Service | A |
| HCM 2000 Volume to Capacity ratio | 0.39 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 48.6% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

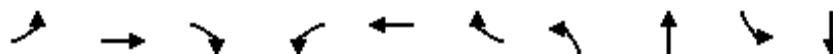
c Critical Lane Group

Timings

<Future>PM

9: Laurelcrest Street/Leeward Drive & Vodden Street East

03-12-2020

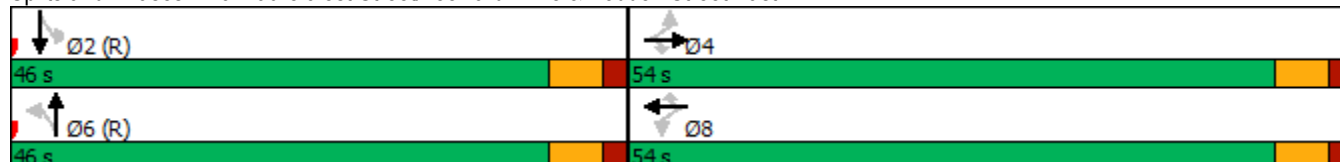


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↘ | ↑ | ↗ | ↘ | ↑ | ↗ | ↘ | ↗ | ↘ | ↗ |
| Traffic Volume (vph) | 5 | 442 | 108 | 87 | 609 | 13 | 317 | 13 | 4 | 5 |
| Future Volume (vph) | 5 | 442 | 108 | 87 | 609 | 13 | 317 | 13 | 4 | 5 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | Perm | NA |
| Protected Phases | | 4 | | | 8 | | | 6 | | 2 |
| Permitted Phases | 4 | | 4 | 8 | | 8 | 6 | | 2 | |
| Detector Phase | 4 | 4 | 4 | 8 | 8 | 8 | 6 | 6 | 2 | 2 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 54.0 | 54.0 | 54.0 | 54.0 | 54.0 | 54.0 | 46.0 | 46.0 | 46.0 | 46.0 |
| Total Split (%) | 54.0% | 54.0% | 54.0% | 54.0% | 54.0% | 54.0% | 46.0% | 46.0% | 46.0% | 46.0% |
| Yellow Time (s) | 4.0 | 4.0 | 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 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | |
| Recall Mode | None | None | None | Max | Max | Max | C-Max | C-Max | C-Max | C-Max |
| Act Effct Green (s) | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 40.0 | 40.0 | 40.0 | 40.0 |
| Actuated g/C Ratio | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 | 0.40 | 0.40 | 0.40 | 0.40 |
| v/c Ratio | 0.03 | 0.53 | 0.15 | 0.30 | 0.73 | 0.02 | 0.62 | 0.31 | 0.01 | 0.01 |
| Control Delay | 14.4 | 20.7 | 5.8 | 19.2 | 26.5 | 1.6 | 29.8 | 4.5 | 18.2 | 14.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 14.4 | 20.7 | 5.8 | 19.2 | 26.5 | 1.6 | 29.8 | 4.5 | 18.2 | 14.0 |
| LOS | B | C | A | B | C | A | C | A | B | B |
| Approach Delay | | 17.8 | | | 25.1 | | | 19.4 | | 15.2 |
| Approach LOS | | B | | | C | | | B | | B |

Intersection Summary

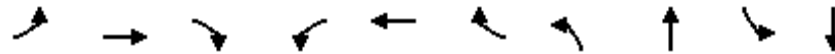
Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 84 (84%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 21.1
 Intersection Capacity Utilization 77.9%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service D

Splits and Phases: 9: Laurelcrest Street/Leeward Drive & Vodden Street East



9: Laurelcrest Street/Leeward Drive & Vodden Street East

03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|------|-------|------|------|-------|------|------|------|------|-------|
| Lane Group Flow (vph) | 5 | 480 | 117 | 95 | 662 | 14 | 345 | 240 | 4 | 10 |
| v/c Ratio | 0.03 | 0.53 | 0.15 | 0.30 | 0.73 | 0.02 | 0.62 | 0.31 | 0.01 | 0.01 |
| Control Delay | 14.4 | 20.7 | 5.8 | 19.2 | 26.5 | 1.6 | 29.8 | 4.5 | 18.2 | 14.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 14.4 | 20.7 | 5.8 | 19.2 | 26.5 | 1.6 | 29.8 | 4.5 | 18.2 | 14.0 |
| Queue Length 50th (m) | 0.5 | 62.4 | 3.4 | 10.8 | 98.6 | 0.0 | 52.3 | 1.6 | 0.5 | 0.6 |
| Queue Length 95th (m) | 2.5 | 90.7 | 12.5 | 22.6 | 141.3 | 1.3 | 82.2 | 15.9 | 2.6 | 3.7 |
| Internal Link Dist (m) | | 266.2 | | | 256.7 | | | 92.3 | | 301.6 |
| Turn Bay Length (m) | 36.0 | | 30.0 | 42.5 | | 30.0 | 43.0 | | 22.0 | |
| Base Capacity (vph) | 183 | 912 | 786 | 315 | 912 | 766 | 558 | 772 | 418 | 713 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.03 | 0.53 | 0.15 | 0.30 | 0.73 | 0.02 | 0.62 | 0.31 | 0.01 | 0.01 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis
 9: Laurelcrest Street/Leeward Drive & Vodden Street East

<Future>PM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---------------------------|------|------|------|------|-------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ | ↖ | ↗ | ↘ |
| Traffic Volume (vph) | 5 | 442 | 108 | 87 | 609 | 13 | 317 | 13 | 208 | 4 | 5 | 5 |
| Future Volume (vph) | 5 | 442 | 108 | 87 | 609 | 13 | 317 | 13 | 208 | 4 | 5 | 5 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 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 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.97 | 1.00 | 1.00 | 0.98 | 1.00 | 0.97 | 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 | 1.00 | 1.00 | 1.00 |
| Fr _t | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.86 | 1.00 | 0.93 | 1.00 | 0.93 |
| Fl _t Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1784 | 1902 | 1549 | 1743 | 1902 | 1562 | 1767 | 1593 | 1777 | 1777 | 1777 | 1777 |
| Fl _t Permitted | 0.20 | 1.00 | 1.00 | 0.36 | 1.00 | 1.00 | 0.75 | 1.00 | 0.56 | 1.00 | 1.00 | 1.00 |
| Satd. Flow (perm) | 384 | 1902 | 1549 | 656 | 1902 | 1562 | 1397 | 1593 | 1048 | 1777 | 1777 | 1777 |
| 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) | 5 | 480 | 117 | 95 | 662 | 14 | 345 | 14 | 226 | 4 | 5 | 5 |
| RTOR Reduction (vph) | 0 | 0 | 43 | 0 | 0 | 7 | 0 | 136 | 0 | 0 | 3 | 0 |
| Lane Group Flow (vph) | 5 | 480 | 74 | 95 | 662 | 7 | 345 | 104 | 0 | 4 | 7 | 0 |
| Confl. Peds. (#/hr) | 1 | | 5 | 5 | | 1 | | | 3 | 3 | | |
| Heavy Vehicles (%) | 0% | 1% | 0% | 2% | 1% | 0% | 1% | 0% | 1% | 0% | 0% | 0% |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 6 | | | | 2 |
| Permitted Phases | 4 | | 4 | 8 | | 8 | 6 | | | 2 | | |
| Actuated Green, G (s) | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 40.0 | 40.0 | | 40.0 | 40.0 | |
| Effective Green, g (s) | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 | 40.0 | 40.0 | | 40.0 | 40.0 | |
| Actuated g/C Ratio | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 | 0.48 | 0.40 | 0.40 | | 0.40 | 0.40 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 184 | 912 | 743 | 314 | 912 | 749 | 558 | 637 | | 419 | 710 | |
| v/s Ratio Prot | | 0.25 | | | c0.35 | | | 0.07 | | | | 0.00 |
| v/s Ratio Perm | 0.01 | | 0.05 | 0.14 | | 0.00 | c0.25 | | | 0.00 | | |
| v/c Ratio | 0.03 | 0.53 | 0.10 | 0.30 | 0.73 | 0.01 | 0.62 | 0.16 | | 0.01 | 0.01 | |
| Uniform Delay, d1 | 13.7 | 18.1 | 14.2 | 15.8 | 20.7 | 13.6 | 23.9 | 19.3 | | 18.1 | 18.1 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.1 | 1.0 | 0.1 | 2.5 | 5.0 | 0.0 | 5.1 | 0.6 | | 0.0 | 0.0 | |
| Delay (s) | 13.8 | 19.1 | 14.3 | 18.3 | 25.8 | 13.6 | 29.0 | 19.8 | | 18.1 | 18.1 | |
| Level of Service | B | B | B | B | C | B | C | B | | B | B | |
| Approach Delay (s) | | 18.2 | | | 24.6 | | | 25.2 | | | 18.1 | |
| Approach LOS | | B | | | C | | | C | | | B | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 22.8 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.68 | | |
| Actuated Cycle Length (s) | 100.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 77.9% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

Timings
10: Vodden Street East & Howden Blvd

<Future>PM
03-12-2020

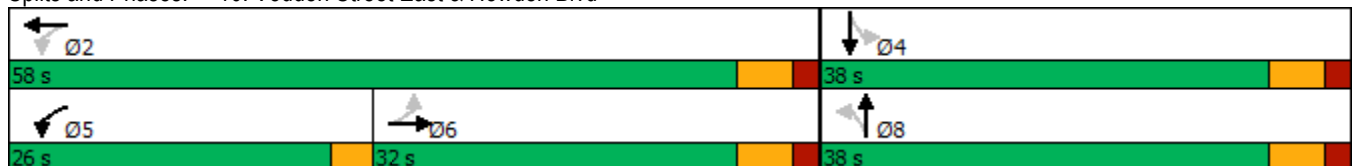


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↗ | ↖ | ↗ | ↖ | ↗ |
| Traffic Volume (vph) | 8 | 176 | 472 | 306 | 441 | 9 | 2 | 3 |
| Future Volume (vph) | 8 | 176 | 472 | 306 | 441 | 9 | 2 | 3 |
| Turn Type | Perm | NA | pm+pt | NA | Perm | NA | Perm | NA |
| Protected Phases | | 6 | 5 | 2 | | 8 | | 4 |
| Permitted Phases | 6 | | 2 | | 8 | | 4 | |
| Detector Phase | 6 | 6 | 5 | 2 | 8 | 8 | 4 | 4 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 24.0 | 24.0 | 9.0 | 24.0 | 27.0 | 27.0 | 27.0 | 27.0 |
| Total Split (s) | 32.0 | 32.0 | 26.0 | 58.0 | 38.0 | 38.0 | 38.0 | 38.0 |
| Total Split (%) | 33.3% | 33.3% | 27.1% | 60.4% | 39.6% | 39.6% | 39.6% | 39.6% |
| Yellow Time (s) | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 0.0 | 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 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lag | Lag | Lead | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | | | | | |
| Recall Mode | Max | Max | None | Max | None | None | None | None |
| Act Effct Green (s) | 26.8 | 26.8 | 55.0 | 52.0 | 31.7 | 31.7 | 31.7 | 31.7 |
| Actuated g/C Ratio | 0.28 | 0.28 | 0.57 | 0.54 | 0.33 | 0.33 | 0.33 | 0.33 |
| v/c Ratio | 0.03 | 0.91 | 0.96 | 0.30 | 0.95 | 0.39 | 0.01 | 0.01 |
| Control Delay | 26.2 | 50.9 | 55.9 | 13.0 | 64.1 | 5.2 | 21.5 | 19.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.2 | 50.9 | 55.9 | 13.0 | 64.1 | 5.2 | 21.5 | 19.5 |
| LOS | C | D | E | B | E | A | C | B |
| Approach Delay | | 50.5 | | 39.0 | | 41.6 | | 20.2 |
| Approach LOS | | D | | D | | D | | C |

Intersection Summary

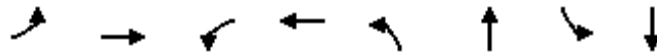
Cycle Length: 96
 Actuated Cycle Length: 95.7
 Natural Cycle: 75
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.96
 Intersection Signal Delay: 42.7
 Intersection LOS: D
 Intersection Capacity Utilization 98.8%
 ICU Level of Service F
 Analysis Period (min) 15

Splits and Phases: 10: Vodden Street East & Howden Blvd



Queues
10: Vodden Street East & Howden Blvd

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|------------------------|------|--------|--------|-------|--------|-------|------|------|
| Lane Group Flow (vph) | 8 | 483 | 472 | 306 | 441 | 273 | 2 | 4 |
| v/c Ratio | 0.03 | 0.91 | 0.96 | 0.30 | 0.95 | 0.39 | 0.01 | 0.01 |
| Control Delay | 26.2 | 50.9 | 55.9 | 13.0 | 64.1 | 5.2 | 21.5 | 19.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.2 | 50.9 | 55.9 | 13.0 | 64.1 | 5.2 | 21.5 | 19.5 |
| Queue Length 50th (m) | 1.1 | 73.2 | 68.2 | 29.4 | 78.8 | 1.1 | 0.2 | 0.4 |
| Queue Length 95th (m) | 4.5 | #133.7 | #127.5 | 45.4 | #137.7 | 17.5 | 1.7 | 2.6 |
| Internal Link Dist (m) | | 397.6 | | 661.5 | | 256.7 | | 23.3 |
| Turn Bay Length (m) | 6.0 | | 25.5 | | 150.0 | | | |
| Base Capacity (vph) | 298 | 531 | 508 | 1011 | 469 | 705 | 306 | 614 |
| 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 | 0.03 | 0.91 | 0.93 | 0.30 | 0.94 | 0.39 | 0.01 | 0.01 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
10: Vodden Street East & Howden Blvd

<Future>PM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|-------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | |
| Traffic Volume (vph) | 8 | 176 | 307 | 472 | 306 | 0 | 441 | 9 | 264 | 2 | 3 | 1 |
| Future Volume (vph) | 8 | 176 | 307 | 472 | 306 | 0 | 441 | 9 | 264 | 2 | 3 | 1 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | | 3.0 | 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 | |
| Frbp, ped/bikes | 1.00 | 0.98 | | 1.00 | 1.00 | | 1.00 | 0.97 | | 1.00 | 0.99 | |
| Flpb, ped/bikes | 0.99 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | |
| Frt | 1.00 | 0.90 | | 1.00 | 1.00 | | 1.00 | 0.85 | | 1.00 | 0.96 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1766 | 1665 | | 1767 | 1861 | | 1765 | 1585 | | 1778 | 1835 | |
| Flt Permitted | 0.57 | 1.00 | | 0.13 | 1.00 | | 0.76 | 1.00 | | 0.49 | 1.00 | |
| Satd. Flow (perm) | 1067 | 1665 | | 250 | 1861 | | 1403 | 1585 | | 917 | 1835 | |
| Peak-hour factor, PHF | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 8 | 176 | 307 | 472 | 306 | 0 | 441 | 9 | 264 | 2 | 3 | 1 |
| RTOR Reduction (vph) | 0 | 65 | 0 | 0 | 0 | 0 | 0 | 177 | 0 | 0 | 1 | 0 |
| Lane Group Flow (vph) | 8 | 418 | 0 | 472 | 306 | 0 | 441 | 96 | 0 | 2 | 3 | 0 |
| Confl. Peds. (#/hr) | 6 | | 2 | 2 | | 6 | 5 | | 3 | 3 | | 5 |
| Heavy Vehicles (%) | 0% | 4% | 0% | 1% | 2% | 2% | 0% | 0% | 1% | 0% | 0% | 0% |
| Bus Blockages (#/hr) | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | Perm | NA | | pm+pt | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 6 | | 5 | 2 | | | 8 | | | 4 | |
| Permitted Phases | 6 | | | 2 | | | 8 | | | 4 | | |
| Actuated Green, G (s) | 26.8 | 26.8 | | 52.0 | 52.0 | | 31.7 | 31.7 | | 31.7 | 31.7 | |
| Effective Green, g (s) | 26.8 | 26.8 | | 52.0 | 52.0 | | 31.7 | 31.7 | | 31.7 | 31.7 | |
| Actuated g/C Ratio | 0.28 | 0.28 | | 0.54 | 0.54 | | 0.33 | 0.33 | | 0.33 | 0.33 | |
| Clearance Time (s) | 6.0 | 6.0 | | 3.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 3.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 298 | 466 | | 487 | 1011 | | 464 | 525 | | 303 | 607 | |
| v/s Ratio Prot | | 0.25 | | c0.22 | 0.16 | | | 0.06 | | | 0.00 | |
| v/s Ratio Perm | 0.01 | | | c0.30 | | | c0.31 | | | 0.00 | | |
| v/c Ratio | 0.03 | 0.90 | | 0.97 | 0.30 | | 0.95 | 0.18 | | 0.01 | 0.01 | |
| Uniform Delay, d1 | 25.0 | 33.1 | | 26.8 | 11.9 | | 31.2 | 22.8 | | 21.4 | 21.4 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 0.2 | 22.7 | | 32.5 | 0.8 | | 30.1 | 0.4 | | 0.0 | 0.0 | |
| Delay (s) | 25.2 | 55.8 | | 59.3 | 12.7 | | 61.3 | 23.1 | | 21.5 | 21.4 | |
| Level of Service | C | E | | E | B | | E | C | | C | C | |
| Approach Delay (s) | | 55.3 | | | 41.0 | | | 46.7 | | | 21.5 | |
| Approach LOS | | E | | | D | | | D | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 46.5 | HCM 2000 Level of Service | D |
| HCM 2000 Volume to Capacity ratio | 0.99 | | |
| Actuated Cycle Length (s) | 95.7 | Sum of lost time (s) | 15.0 |
| Intersection Capacity Utilization | 98.8% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group

Timings
11: Howden Blvd/N Park Drive & Willams Parkway

<Future>PM
03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | NBR | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↘ | ↑↑ | ↘ | ↘ | ↑↑ | ↘ | ↑ | ↘ | ↘ | ↑ | ↘ |
| Traffic Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 228 | 430 | 107 | 28 | 335 | 381 |
| Future Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 228 | 430 | 107 | 28 | 335 | 381 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | pm+pt | NA | Perm | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | 7 | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 4 | | 4 | 8 | | 8 |
| Detector Phase | 5 | 2 | 2 | 6 | 6 | 7 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | | |
| Minimum Initial (s) | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 6.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 9.0 | 43.0 | 43.0 | 43.0 | 43.0 | 9.0 | 48.0 | 48.0 | 48.0 | 48.0 | 48.0 |
| Total Split (s) | 21.0 | 94.0 | 94.0 | 73.0 | 73.0 | 18.0 | 66.0 | 66.0 | 48.0 | 48.0 | 48.0 |
| Total Split (%) | 13.1% | 58.8% | 58.8% | 45.6% | 45.6% | 11.3% | 41.3% | 41.3% | 30.0% | 30.0% | 30.0% |
| Yellow Time (s) | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 0.0 | 2.0 | 2.0 | 2.0 | 2.0 | 0.0 | 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 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | Lead | | | Lag | Lag | Lead | | | Lag | Lag | Lag |
| Lead-Lag Optimize? | | | | | | | | | | | |
| Recall Mode | None | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None | None |
| Act Effct Green (s) | 94.8 | 91.8 | 91.8 | 72.2 | 72.2 | 59.2 | 56.2 | 56.2 | 38.2 | 38.2 | 38.2 |
| Actuated g/C Ratio | 0.59 | 0.57 | 0.57 | 0.45 | 0.45 | 0.37 | 0.35 | 0.35 | 0.24 | 0.24 | 0.24 |
| v/c Ratio | 0.93 | 0.39 | 0.23 | 0.37 | 0.84 | 0.96 | 0.70 | 0.19 | 0.20 | 0.81 | 0.88 |
| Control Delay | 88.4 | 19.9 | 10.3 | 35.5 | 45.8 | 85.5 | 50.5 | 14.8 | 50.5 | 71.9 | 59.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 88.4 | 19.9 | 10.3 | 35.5 | 45.8 | 85.5 | 50.5 | 14.8 | 50.5 | 71.9 | 59.9 |
| LOS | F | B | B | D | D | F | D | B | D | E | E |
| Approach Delay | | 30.2 | | | 45.0 | | 56.0 | | | 65.0 | |
| Approach LOS | | C | | | D | | E | | | E | |

Intersection Summary

Cycle Length: 160
 Actuated Cycle Length: 160
 Offset: 7 (4%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.96
 Intersection Signal Delay: 46.6
 Intersection LOS: D
 Intersection Capacity Utilization 94.6%
 ICU Level of Service F
 Analysis Period (min) 15

Splits and Phases: 11: Howden Blvd/N Park Drive & Willams Parkway



Queues

<Future>PM

11: Howden Blvd/N Park Drive & Willams Parkway

03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|--------|-------|------|------|-------|-------|-------|------|------|-------|--------|
| Lane Group Flow (vph) | 216 | 786 | 226 | 110 | 1371 | 248 | 467 | 116 | 30 | 364 | 414 |
| v/c Ratio | 0.93 | 0.39 | 0.23 | 0.37 | 0.84 | 0.96 | 0.70 | 0.19 | 0.20 | 0.81 | 0.88 |
| Control Delay | 88.4 | 19.9 | 10.3 | 35.5 | 45.8 | 85.5 | 50.5 | 14.8 | 50.5 | 71.9 | 59.9 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 88.4 | 19.9 | 10.3 | 35.5 | 45.8 | 85.5 | 50.5 | 14.8 | 50.5 | 71.9 | 59.9 |
| Queue Length 50th (m) | 53.3 | 73.9 | 19.2 | 24.2 | 213.4 | 55.4 | 123.0 | 9.2 | 7.5 | 106.9 | 88.6 |
| Queue Length 95th (m) | #101.2 | 89.1 | 34.6 | 43.0 | 246.5 | #99.5 | 162.5 | 23.4 | 17.5 | 144.8 | #141.3 |
| Internal Link Dist (m) | | 268.4 | | | 661.6 | | 117.9 | | | 218.4 | |
| Turn Bay Length (m) | 162.0 | | 20.0 | 44.0 | | 52.5 | | 52.5 | 44.0 | | 21.5 |
| Base Capacity (vph) | 246 | 2037 | 979 | 299 | 1625 | 258 | 713 | 637 | 165 | 494 | 502 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.88 | 0.39 | 0.23 | 0.37 | 0.84 | 0.96 | 0.65 | 0.18 | 0.18 | 0.74 | 0.82 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 11: Howden Blvd/N Park Drive & Willams Parkway

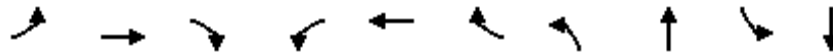
<Future>PM
 03-12-2020

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|-------|------|-------|------|------|------|-------|------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 27 | 228 | 430 | 107 | 28 | 335 | 381 |
| Future Volume (vph) | 199 | 723 | 208 | 101 | 1235 | 27 | 228 | 430 | 107 | 28 | 335 | 381 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lane Util. Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frbp, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1767 | 3550 | 1633 | 1785 | 3601 | | 1785 | 1902 | 1581 | 1785 | 1883 | 1542 |
| Flt Permitted | 0.05 | 1.00 | 1.00 | 0.35 | 1.00 | | 0.18 | 1.00 | 1.00 | 0.33 | 1.00 | 1.00 |
| Satd. Flow (perm) | 99 | 3550 | 1633 | 666 | 3601 | | 331 | 1902 | 1581 | 629 | 1883 | 1542 |
| 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) | 216 | 786 | 226 | 110 | 1342 | 29 | 248 | 467 | 116 | 30 | 364 | 414 |
| RTOR Reduction (vph) | 0 | 0 | 42 | 0 | 1 | 0 | 0 | 0 | 46 | 0 | 0 | 101 |
| Lane Group Flow (vph) | 216 | 786 | 184 | 110 | 1370 | 0 | 248 | 467 | 70 | 30 | 364 | 313 |
| Confl. Peds. (#/hr) | 4 | | | | | 4 | 3 | | | | | 3 |
| Heavy Vehicles (%) | 1% | 2% | 0% | 0% | 1% | 0% | 0% | 1% | 1% | 0% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turn Type | pm+pt | NA | Perm | Perm | NA | | pm+pt | NA | Perm | Perm | NA | Perm |
| Protected Phases | 5 | 2 | | | 6 | | 7 | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | | 4 | | 4 | 8 | | 8 |
| Actuated Green, G (s) | 91.8 | 91.8 | 91.8 | 72.1 | 72.1 | | 56.2 | 56.2 | 56.2 | 38.2 | 38.2 | 38.2 |
| Effective Green, g (s) | 91.8 | 91.8 | 91.8 | 72.1 | 72.1 | | 56.2 | 56.2 | 56.2 | 38.2 | 38.2 | 38.2 |
| Actuated g/C Ratio | 0.57 | 0.57 | 0.57 | 0.45 | 0.45 | | 0.35 | 0.35 | 0.35 | 0.24 | 0.24 | 0.24 |
| Clearance Time (s) | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 3.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 230 | 2036 | 936 | 300 | 1622 | | 252 | 668 | 555 | 150 | 449 | 368 |
| v/s Ratio Prot | c0.10 | 0.22 | | | 0.38 | | c0.09 | 0.25 | | | 0.19 | |
| v/s Ratio Perm | c0.44 | | 0.11 | 0.17 | | | c0.25 | | 0.04 | 0.05 | | 0.20 |
| v/c Ratio | 0.94 | 0.39 | 0.20 | 0.37 | 0.84 | | 0.98 | 0.70 | 0.13 | 0.20 | 0.81 | 0.85 |
| Uniform Delay, d1 | 52.6 | 18.7 | 16.4 | 28.9 | 39.0 | | 44.9 | 44.6 | 35.2 | 48.7 | 57.5 | 58.2 |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 42.2 | 0.6 | 0.5 | 3.4 | 5.6 | | 51.9 | 4.1 | 0.2 | 1.4 | 11.9 | 18.1 |
| Delay (s) | 94.8 | 19.2 | 16.8 | 32.4 | 44.6 | | 96.7 | 48.7 | 35.4 | 50.1 | 69.4 | 76.2 |
| Level of Service | F | B | B | C | D | | F | D | D | D | E | E |
| Approach Delay (s) | | 32.1 | | | 43.7 | | | 61.2 | | | 72.2 | |
| Approach LOS | | C | | | D | | | E | | | E | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 49.0 | | | | | | | | | D |
| HCM 2000 Volume to Capacity ratio | | | 0.99 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 160.0 | | | | | | | | 18.0 | |
| Intersection Capacity Utilization | | | 94.6% | | | | | | | | | F |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
12: Dixie Road & Howden Blvd

<Future>PM
03-12-2020

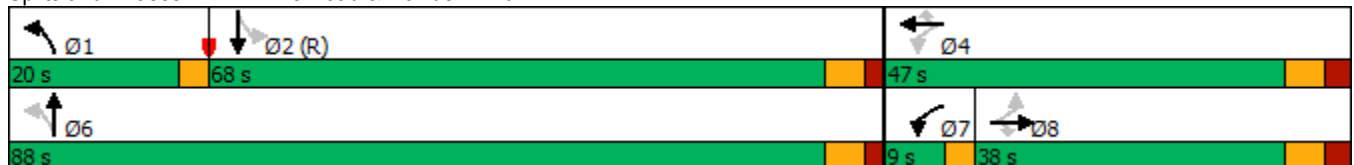


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↖ | ↗ | ↖ | ↖ | ↕ | ↖ | ↕ |
| Traffic Volume (vph) | 38 | 230 | 164 | 79 | 474 | 86 | 342 | 1630 | 48 | 578 |
| Future Volume (vph) | 38 | 230 | 164 | 79 | 474 | 86 | 342 | 1630 | 48 | 578 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | Perm | NA |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | 2 |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | 2 | |
| Detector Phase | 8 | 8 | 8 | 7 | 4 | 4 | 1 | 6 | 2 | 2 |
| Switch Phase | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 5.0 | 8.0 | 8.0 | 5.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.8 | 36.8 | 36.8 | 8.0 | 36.8 | 36.8 | 8.0 | 40.1 | 40.1 | 40.1 |
| Total Split (s) | 38.0 | 38.0 | 38.0 | 9.0 | 47.0 | 47.0 | 20.0 | 88.0 | 68.0 | 68.0 |
| Total Split (%) | 28.1% | 28.1% | 28.1% | 6.7% | 34.8% | 34.8% | 14.8% | 65.2% | 50.4% | 50.4% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 3.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.8 | 2.8 | 2.8 | 0.0 | 2.8 | 2.8 | 0.0 | 2.1 | 2.1 | 2.1 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.1 | 6.1 | 6.1 |
| Lead/Lag | Lag | Lag | Lag | Lead | | | Lead | | Lag | Lag |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | | | Yes | | Yes | Yes |
| Recall Mode | None | None | None | None | None | None | None | Max | C-Max | C-Max |
| Act Effct Green (s) | 29.8 | 29.8 | 29.8 | 42.6 | 38.8 | 38.8 | 86.4 | 83.3 | 64.5 | 64.5 |
| Actuated g/C Ratio | 0.22 | 0.22 | 0.22 | 0.32 | 0.29 | 0.29 | 0.64 | 0.62 | 0.48 | 0.48 |
| v/c Ratio | 0.57 | 0.58 | 0.35 | 0.30 | 0.91 | 0.18 | 0.66 | 0.84 | 0.88 | 0.38 |
| Control Delay | 79.0 | 53.1 | 8.2 | 35.8 | 69.0 | 18.2 | 18.0 | 25.2 | 126.5 | 23.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 79.0 | 53.1 | 8.2 | 35.8 | 69.0 | 18.2 | 18.0 | 25.2 | 126.5 | 23.7 |
| LOS | E | D | A | D | E | B | B | C | F | C |
| Approach Delay | | 38.4 | | | 58.0 | | | 24.0 | | 31.2 |
| Approach LOS | | D | | | E | | | C | | C |

Intersection Summary

Cycle Length: 135
 Actuated Cycle Length: 135
 Offset: 32 (24%), Referenced to phase 2:SBTL, Start of Green
 Natural Cycle: 105
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 32.6
 Intersection Capacity Utilization 108.9%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service G

Splits and Phases: 12: Dixie Road & Howden Blvd

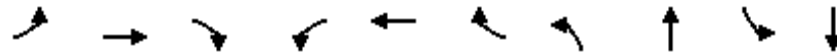


Queues

<Future>PM

12: Dixie Road & Howden Blvd

03-12-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|------------------------|-------|-------|------|------|--------|------|------|-------|-------|-------|
| Lane Group Flow (vph) | 39 | 235 | 167 | 81 | 484 | 88 | 349 | 1792 | 49 | 626 |
| v/c Ratio | 0.57 | 0.58 | 0.35 | 0.30 | 0.91 | 0.18 | 0.66 | 0.84 | 0.88 | 0.38 |
| Control Delay | 79.0 | 53.1 | 8.2 | 35.8 | 69.0 | 18.2 | 18.0 | 25.2 | 126.5 | 23.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 79.0 | 53.1 | 8.2 | 35.8 | 69.0 | 18.2 | 18.0 | 25.2 | 126.5 | 23.7 |
| Queue Length 50th (m) | 9.2 | 55.7 | 0.0 | 15.3 | 123.0 | 7.5 | 40.5 | 192.5 | 11.9 | 56.5 |
| Queue Length 95th (m) | #26.0 | 82.8 | 17.9 | 27.5 | #182.1 | 20.5 | 57.6 | 227.7 | #38.7 | 71.6 |
| Internal Link Dist (m) | | 661.5 | | | 187.9 | | | 169.3 | | 320.7 |
| Turn Bay Length (m) | 53.0 | | 53.0 | 66.0 | | 66.0 | 71.5 | | 40.0 | |
| Base Capacity (vph) | 72 | 422 | 486 | 270 | 549 | 498 | 536 | 2146 | 56 | 1635 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.54 | 0.56 | 0.34 | 0.30 | 0.88 | 0.18 | 0.65 | 0.84 | 0.88 | 0.38 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

12: Dixie Road & Howden Blvd

<Future>PM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|--------|-------|-------|------|-------|-------|------|-------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 38 | 230 | 164 | 79 | 474 | 86 | 342 | 1630 | 126 | 48 | 578 | 35 |
| Future Volume (vph) | 38 | 230 | 164 | 79 | 474 | 86 | 342 | 1630 | 126 | 48 | 578 | 35 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 |
| Total Lost time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.1 | | 6.1 | 6.1 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.95 | | 1.00 | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.98 | 1.00 | 1.00 | 0.98 | 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 | 1.00 | |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.99 | | 1.00 | 0.99 | |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | |
| Satd. Flow (prot) | 1777 | 1828 | 1548 | 1747 | 1846 | 1559 | 1746 | 3475 | | 1732 | 3416 | |
| Flt Permitted | 0.17 | 1.00 | 1.00 | 0.39 | 1.00 | 1.00 | 0.34 | 1.00 | | 0.06 | 1.00 | |
| Satd. Flow (perm) | 313 | 1828 | 1548 | 714 | 1846 | 1559 | 619 | 3475 | | 118 | 3416 | |
| Peak-hour factor, PHF | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Adj. Flow (vph) | 39 | 235 | 167 | 81 | 484 | 88 | 349 | 1663 | 129 | 49 | 590 | 36 |
| RTOR Reduction (vph) | 0 | 0 | 130 | 0 | 0 | 35 | 0 | 4 | 0 | 0 | 3 | 0 |
| Lane Group Flow (vph) | 39 | 235 | 37 | 81 | 484 | 53 | 349 | 1788 | 0 | 49 | 623 | 0 |
| Confl. Peds. (#/hr) | 9 | | 7 | 7 | | 9 | 11 | | 7 | 7 | | 11 |
| Heavy Vehicles (%) | 0% | 3% | 1% | 2% | 2% | 0% | 2% | 2% | 2% | 3% | 4% | 0% |
| Bus Blockages (#/hr) | 0 | 5 | 0 | 0 | 5 | 0 | 0 | 8 | 0 | 0 | 9 | 0 |
| Turn Type | Perm | NA | Perm | pm+pt | NA | Perm | pm+pt | NA | | Perm | NA | |
| Protected Phases | | 8 | | 7 | 4 | | 1 | 6 | | | 2 | |
| Permitted Phases | 8 | | 8 | 4 | | 4 | 6 | | | 2 | | |
| Actuated Green, G (s) | 29.8 | 29.8 | 29.8 | 38.8 | 38.8 | 38.8 | 83.3 | 83.3 | | 64.6 | 64.6 | |
| Effective Green, g (s) | 29.8 | 29.8 | 29.8 | 38.8 | 38.8 | 38.8 | 83.3 | 83.3 | | 64.6 | 64.6 | |
| Actuated g/C Ratio | 0.22 | 0.22 | 0.22 | 0.29 | 0.29 | 0.29 | 0.62 | 0.62 | | 0.48 | 0.48 | |
| Clearance Time (s) | 6.8 | 6.8 | 6.8 | 3.0 | 6.8 | 6.8 | 3.0 | 6.1 | | 6.1 | 6.1 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 3.0 | 5.0 | 5.0 | 3.0 | 5.0 | | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 69 | 403 | 341 | 251 | 530 | 448 | 513 | 2144 | | 56 | 1634 | |
| v/s Ratio Prot | | 0.13 | | 0.01 | c0.26 | | 0.08 | c0.51 | | | 0.18 | |
| v/s Ratio Perm | 0.12 | | 0.02 | 0.08 | | 0.03 | 0.34 | | | c0.42 | | |
| v/c Ratio | 0.57 | 0.58 | 0.11 | 0.32 | 0.91 | 0.12 | 0.68 | 0.83 | | 0.88 | 0.38 | |
| Uniform Delay, d1 | 46.8 | 47.0 | 42.0 | 36.5 | 46.5 | 35.5 | 13.5 | 20.4 | | 31.6 | 22.5 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | | 1.00 | 1.00 | |
| Incremental Delay, d2 | 16.3 | 3.3 | 0.3 | 0.7 | 21.1 | 0.2 | 3.7 | 4.0 | | 87.8 | 0.7 | |
| Delay (s) | 63.1 | 50.4 | 42.3 | 37.3 | 67.6 | 35.7 | 17.2 | 24.4 | | 119.4 | 23.1 | |
| Level of Service | E | D | D | D | E | D | B | C | | F | C | |
| Approach Delay (s) | | 48.4 | | | 59.5 | | | 23.2 | | | 30.1 | |
| Approach LOS | | D | | | E | | | C | | | C | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 2000 Control Delay | | | 33.3 | | | | | | | | | C |
| HCM 2000 Volume to Capacity ratio | | | 0.90 | | | | | | | | | |
| Actuated Cycle Length (s) | | | 135.0 | | | | | | | 18.9 | | |
| Intersection Capacity Utilization | | | 108.9% | | | | | | | | | G |
| Analysis Period (min) | | | 15 | | | | | | | | | |

c Critical Lane Group

Timings
13: Hanover Road/Highview Trail & Howden Blvd

<Future>PM
03-12-2020

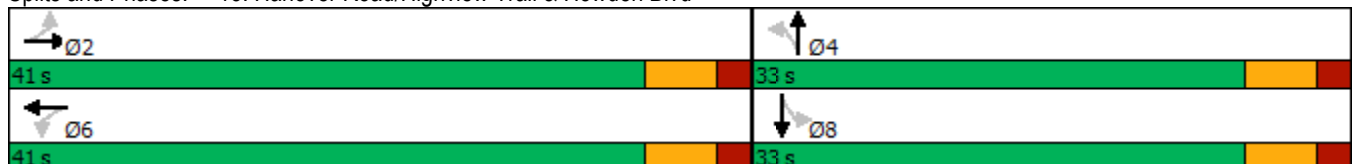


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↔ | ↔ | ↔ | ↔ | ↔ | ↔ | | ↔ |
| Traffic Volume (vph) | 19 | 245 | 12 | 469 | 129 | 2 | 9 | 2 |
| Future Volume (vph) | 19 | 245 | 12 | 469 | 129 | 2 | 9 | 2 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (s) | 41.0 | 41.0 | 41.0 | 41.0 | 33.0 | 33.0 | 33.0 | 33.0 |
| Total Split (%) | 55.4% | 55.4% | 55.4% | 55.4% | 44.6% | 44.6% | 44.6% | 44.6% |
| 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | Max | Max | Max | Max | None | None | None | None |
| Act Effct Green (s) | 40.8 | 40.8 | 40.8 | 40.8 | 13.6 | 13.6 | | 13.4 |
| Actuated g/C Ratio | 0.66 | 0.66 | 0.66 | 0.66 | 0.22 | 0.22 | | 0.22 |
| v/c Ratio | 0.04 | 0.37 | 0.02 | 0.42 | 0.48 | 0.07 | | 0.11 |
| Control Delay | 7.1 | 7.4 | 6.9 | 8.9 | 26.5 | 8.7 | | 10.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | 7.1 | 7.4 | 6.9 | 8.9 | 26.5 | 8.7 | | 10.4 |
| LOS | A | A | A | A | C | A | | B |
| Approach Delay | | 7.4 | | 8.8 | | 23.5 | | 10.4 |
| Approach LOS | | A | | A | | C | | B |

Intersection Summary

Cycle Length: 74
 Actuated Cycle Length: 61.8
 Natural Cycle: 70
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.48
 Intersection Signal Delay: 10.4
 Intersection Capacity Utilization 50.3%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 13: Hanover Road/Highview Trail & Howden Blvd

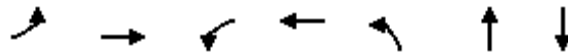


Queues

13: Hanover Road/Highview Trail & Howden Blvd

<Future>PM

03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBT |
|------------------------|------|-------|-------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 21 | 436 | 13 | 522 | 140 | 28 | 40 |
| v/c Ratio | 0.04 | 0.37 | 0.02 | 0.42 | 0.48 | 0.07 | 0.11 |
| Control Delay | 7.1 | 7.4 | 6.9 | 8.9 | 26.5 | 8.7 | 10.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 7.1 | 7.4 | 6.9 | 8.9 | 26.5 | 8.7 | 10.4 |
| Queue Length 50th (m) | 0.9 | 19.7 | 0.6 | 29.4 | 13.6 | 0.2 | 1.1 |
| Queue Length 95th (m) | 4.0 | 44.3 | 2.9 | 60.8 | 27.4 | 5.1 | 7.0 |
| Internal Link Dist (m) | | 187.9 | | 607.3 | | 181.5 | 108.7 |
| Turn Bay Length (m) | 70.0 | | 100.0 | | 100.0 | | |
| Base Capacity (vph) | 528 | 1184 | 603 | 1253 | 583 | 722 | 721 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.04 | 0.37 | 0.02 | 0.42 | 0.24 | 0.04 | 0.06 |

Intersection Summary

HCM Signalized Intersection Capacity Analysis

13: Hanover Road/Highview Trail & Howden Blvd

<Future>PM
03-12-2020



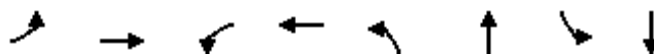
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|------|------|------|------|-------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↗ | | | ↕ | |
| Traffic Volume (vph) | 19 | 245 | 156 | 12 | 469 | 11 | 129 | 2 | 24 | 9 | 2 | 26 |
| Future Volume (vph) | 19 | 245 | 156 | 12 | 469 | 11 | 129 | 2 | 24 | 9 | 2 | 26 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 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 | |
| Frbp, ped/bikes | 1.00 | 0.99 | | 1.00 | 1.00 | | 1.00 | 0.98 | | | 1.00 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Frt | 1.00 | 0.94 | | 1.00 | 1.00 | | 1.00 | 0.86 | | | 0.91 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | | 0.99 | |
| Satd. Flow (prot) | 1779 | 1763 | | 1775 | 1895 | | 1733 | 1616 | | | 1716 | |
| Flt Permitted | 0.43 | 1.00 | | 0.49 | 1.00 | | 0.73 | 1.00 | | | 0.93 | |
| Satd. Flow (perm) | 800 | 1763 | | 915 | 1895 | | 1333 | 1616 | | | 1612 | |
| 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) | 21 | 266 | 170 | 13 | 510 | 12 | 140 | 2 | 26 | 10 | 2 | 28 |
| RTOR Reduction (vph) | 0 | 22 | 0 | 0 | 1 | 0 | 0 | 21 | 0 | 0 | 23 | 0 |
| Lane Group Flow (vph) | 21 | 414 | 0 | 13 | 521 | 0 | 140 | 7 | 0 | 0 | 17 | 0 |
| Confl. Peds. (#/hr) | 6 | | 9 | 9 | | 6 | | | 4 | 4 | | |
| Heavy Vehicles (%) | 0% | 1% | 2% | 0% | 1% | 0% | 3% | 0% | 0% | 0% | 0% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | | 6 | | | 4 | | | 8 | | |
| Actuated Green, G (s) | 39.5 | 39.5 | | 39.5 | 39.5 | | 11.6 | 11.6 | | | 11.6 | |
| Effective Green, g (s) | 39.5 | 39.5 | | 39.5 | 39.5 | | 11.6 | 11.6 | | | 11.6 | |
| Actuated g/C Ratio | 0.63 | 0.63 | | 0.63 | 0.63 | | 0.18 | 0.18 | | | 0.18 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | 500 | 1103 | | 572 | 1186 | | 245 | 297 | | | 296 | |
| v/s Ratio Prot | | 0.23 | | | c0.28 | | | 0.00 | | | | |
| v/s Ratio Perm | 0.03 | | | 0.01 | | | c0.10 | | | | 0.01 | |
| v/c Ratio | 0.04 | 0.38 | | 0.02 | 0.44 | | 0.57 | 0.02 | | | 0.06 | |
| Uniform Delay, d1 | 4.5 | 5.8 | | 4.5 | 6.1 | | 23.5 | 21.1 | | | 21.2 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | 0.2 | 1.0 | | 0.1 | 1.2 | | 5.1 | 0.1 | | | 0.2 | |
| Delay (s) | 4.7 | 6.7 | | 4.6 | 7.3 | | 28.5 | 21.2 | | | 21.4 | |
| Level of Service | A | A | | A | A | | C | C | | | C | |
| Approach Delay (s) | | 6.7 | | | 7.2 | | | 27.3 | | | 21.4 | |
| Approach LOS | | A | | | A | | | C | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 10.3 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.47 | | |
| Actuated Cycle Length (s) | 63.1 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 50.3% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

Timings
14: Central Park Drive & Hanover Road

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03-12-2020

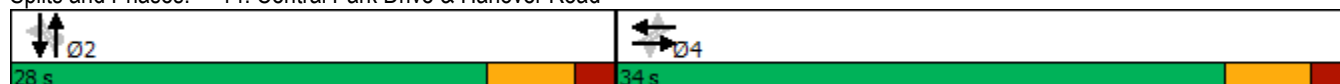


| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↗ | ↖ | ↕ | | ↕ |
| Traffic Volume (vph) | 52 | 2 | 33 | 12 | 392 | 778 | 17 | 350 |
| Future Volume (vph) | 52 | 2 | 33 | 12 | 392 | 778 | 17 | 350 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 4 | | 4 | | 2 | | 2 |
| Permitted Phases | 4 | | 4 | | 2 | | 2 | |
| Detector Phase | 4 | 4 | 4 | 4 | 2 | 2 | 2 | 2 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (s) | 34.0 | 34.0 | 34.0 | 34.0 | 28.0 | 28.0 | 28.0 | 28.0 |
| Total Split (%) | 54.8% | 54.8% | 54.8% | 54.8% | 45.2% | 45.2% | 45.2% | 45.2% |
| 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 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Recall Mode | None | None | None | None | Max | Max | Max | Max |
| Act Effct Green (s) | 10.0 | 10.0 | 10.0 | 10.0 | 26.4 | 26.4 | | 26.4 |
| Actuated g/C Ratio | 0.23 | 0.23 | 0.23 | 0.23 | 0.60 | 0.60 | | 0.60 |
| v/c Ratio | 0.19 | 0.41 | 0.14 | 0.09 | 0.81 | 0.41 | | 0.24 |
| Control Delay | 15.0 | 5.5 | 14.5 | 8.6 | 30.0 | 7.8 | | 6.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 |
| Total Delay | 15.0 | 5.5 | 14.5 | 8.6 | 30.0 | 7.8 | | 6.5 |
| LOS | B | A | B | A | C | A | | A |
| Approach Delay | | 7.5 | | 11.6 | | 15.1 | | 6.5 |
| Approach LOS | | A | | B | | B | | A |

Intersection Summary

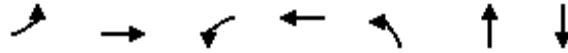
Cycle Length: 62
 Actuated Cycle Length: 44.3
 Natural Cycle: 90
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 12.2
 Intersection Capacity Utilization 82.8%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service E

Splits and Phases: 14: Central Park Drive & Hanover Road



Queues
14: Central Park Drive & Hanover Road

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03-12-2020



| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBT |
|------------------------|-------|-------|------|-------|-------|-------|-------|
| Lane Group Flow (vph) | 57 | 211 | 36 | 36 | 426 | 863 | 450 |
| v/c Ratio | 0.19 | 0.41 | 0.14 | 0.09 | 0.81 | 0.41 | 0.24 |
| Control Delay | 15.0 | 5.5 | 14.5 | 8.6 | 30.0 | 7.8 | 6.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 15.0 | 5.5 | 14.5 | 8.6 | 30.0 | 7.8 | 6.5 |
| Queue Length 50th (m) | 3.5 | 0.1 | 2.2 | 0.8 | 26.3 | 19.1 | 8.3 |
| Queue Length 95th (m) | 9.9 | 11.1 | 7.1 | 5.4 | #82.6 | 37.7 | 18.3 |
| Internal Link Dist (m) | | 532.7 | | 113.0 | | 177.3 | 377.5 |
| Turn Bay Length (m) | 100.0 | | | | 44.5 | | |
| Base Capacity (vph) | 853 | 1052 | 739 | 1097 | 529 | 2118 | 1892 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.07 | 0.20 | 0.05 | 0.03 | 0.81 | 0.41 | 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

14: Central Park Drive & Hanover Road

<Future>PM
03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|------|------|------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↗ | | ↖ | ↗ | | ↖ | ↕ | | | ↕ | |
| Traffic Volume (vph) | 52 | 2 | 192 | 33 | 12 | 21 | 392 | 778 | 16 | 17 | 350 | 48 |
| Future Volume (vph) | 52 | 2 | 192 | 33 | 12 | 21 | 392 | 778 | 16 | 17 | 350 | 48 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 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 | 0.95 | | | 0.95 | |
| Frbp, ped/bikes | 1.00 | 0.98 | | 1.00 | 0.99 | | 1.00 | 1.00 | | | 0.99 | |
| Flpb, ped/bikes | 1.00 | 1.00 | | 1.00 | 1.00 | | 0.99 | 1.00 | | | 1.00 | |
| Frt | 1.00 | 0.85 | | 1.00 | 0.90 | | 1.00 | 1.00 | | | 0.98 | |
| Flt Protected | 0.95 | 1.00 | | 0.95 | 1.00 | | 0.95 | 1.00 | | | 1.00 | |
| Satd. Flow (prot) | 1746 | 1545 | | 1777 | 1721 | | 1725 | 3558 | | | 3472 | |
| Flt Permitted | 0.73 | 1.00 | | 0.63 | 1.00 | | 0.49 | 1.00 | | | 0.91 | |
| Satd. Flow (perm) | 1348 | 1545 | | 1170 | 1721 | | 893 | 3558 | | | 3168 | |
| 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) | 57 | 2 | 209 | 36 | 13 | 23 | 426 | 846 | 17 | 18 | 380 | 52 |
| RTOR Reduction (vph) | 0 | 170 | 0 | 0 | 19 | 0 | 0 | 2 | 0 | 0 | 11 | 0 |
| Lane Group Flow (vph) | 57 | 41 | 0 | 36 | 17 | 0 | 426 | 861 | 0 | 0 | 439 | 0 |
| Confl. Peds. (#/hr) | 5 | | 13 | 13 | | 5 | 26 | | 11 | 11 | | 26 |
| Heavy Vehicles (%) | 2% | 0% | 4% | 0% | 0% | 0% | 2% | 2% | 13% | 0% | 3% | 0% |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 4 | | | 2 | | | | 2 |
| Permitted Phases | 4 | | | 4 | | | 2 | | | 2 | | |
| Actuated Green, G (s) | 8.4 | 8.4 | | 8.4 | 8.4 | | 25.1 | 25.1 | | | 25.1 | |
| Effective Green, g (s) | 8.4 | 8.4 | | 8.4 | 8.4 | | 25.1 | 25.1 | | | 25.1 | |
| Actuated g/C Ratio | 0.18 | 0.18 | | 0.18 | 0.18 | | 0.55 | 0.55 | | | 0.55 | |
| Clearance Time (s) | 6.0 | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | | | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | | 5.0 | 5.0 | | 5.0 | 5.0 | | | 5.0 | |
| Lane Grp Cap (vph) | 248 | 285 | | 216 | 317 | | 492 | 1962 | | | 1747 | |
| v/s Ratio Prot | | 0.03 | | | 0.01 | | | 0.24 | | | | |
| v/s Ratio Perm | c0.04 | | | 0.03 | | | c0.48 | | | | 0.14 | |
| v/c Ratio | 0.23 | 0.14 | | 0.17 | 0.05 | | 0.87 | 0.44 | | | 0.25 | |
| Uniform Delay, d1 | 15.8 | 15.5 | | 15.6 | 15.3 | | 8.8 | 6.0 | | | 5.3 | |
| Progression Factor | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | | 1.00 | |
| Incremental Delay, d2 | 1.0 | 0.5 | | 0.8 | 0.2 | | 18.2 | 0.7 | | | 0.3 | |
| Delay (s) | 16.8 | 16.0 | | 16.4 | 15.4 | | 26.9 | 6.8 | | | 5.7 | |
| Level of Service | B | B | | B | B | | C | A | | | A | |
| Approach Delay (s) | | 16.2 | | | 15.9 | | | 13.4 | | | 5.7 | |
| Approach LOS | | B | | | B | | | B | | | A | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 12.2 | HCM 2000 Level of Service | B |
| HCM 2000 Volume to Capacity ratio | 0.71 | | |
| Actuated Cycle Length (s) | 45.5 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 82.8% | ICU Level of Service | E |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

Timings
15: Central Park Drive & Howden Blvd

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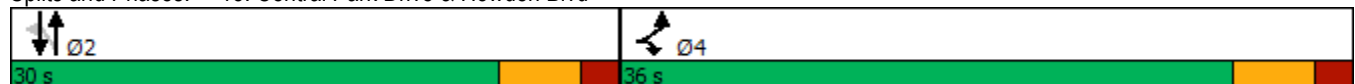


| Lane Group | EBL | EBR | NBL | NBT | SBT |
|----------------------|-------|-------|-------|-------|-------|
| Lane Configurations | | | | | |
| Traffic Volume (vph) | 110 | 78 | 266 | 493 | 242 |
| Future Volume (vph) | 110 | 78 | 266 | 493 | 242 |
| Turn Type | Prot | Prot | Perm | NA | NA |
| Protected Phases | 4 | 4 | | 2 | 2 |
| Permitted Phases | | | 2 | | |
| Detector Phase | 4 | 4 | 2 | 2 | 2 |
| Switch Phase | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (s) | 36.0 | 36.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 54.5% | 54.5% | 45.5% | 45.5% | 45.5% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | |
| Lead-Lag Optimize? | | | | | |
| Recall Mode | None | None | Max | Max | Max |
| Act Effct Green (s) | 10.4 | 10.4 | 29.4 | 29.4 | 29.4 |
| Actuated g/C Ratio | 0.22 | 0.22 | 0.62 | 0.62 | 0.62 |
| v/c Ratio | 0.30 | 0.20 | 0.57 | 0.24 | 0.26 |
| Control Delay | 17.4 | 5.7 | 16.6 | 6.5 | 3.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.4 | 5.7 | 16.6 | 6.5 | 3.5 |
| LOS | B | A | B | A | A |
| Approach Delay | 12.5 | | | 10.0 | 3.5 |
| Approach LOS | B | | | A | A |

Intersection Summary

Cycle Length: 66
 Actuated Cycle Length: 47.6
 Natural Cycle: 75
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.57
 Intersection Signal Delay: 8.1
 Intersection Capacity Utilization 58.7%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service B

Splits and Phases: 15: Central Park Drive & Howden Blvd



Queues

<Future>PM

15: Central Park Drive & Howden Blvd

03-12-2020



| Lane Group | EBL | EBR | NBL | NBT | SBT |
|------------------------|-------|------|-------|-------|-------|
| Lane Group Flow (vph) | 120 | 85 | 289 | 536 | 543 |
| v/c Ratio | 0.30 | 0.20 | 0.57 | 0.24 | 0.26 |
| Control Delay | 17.4 | 5.7 | 16.6 | 6.5 | 3.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 17.4 | 5.7 | 16.6 | 6.5 | 3.5 |
| Queue Length 50th (m) | 8.1 | 0.0 | 15.5 | 11.4 | 5.2 |
| Queue Length 95th (m) | 18.2 | 7.4 | #52.5 | 21.0 | 12.6 |
| Internal Link Dist (m) | 607.3 | | | 377.5 | 147.1 |
| Turn Bay Length (m) | 250.0 | | 65.0 | | |
| Base Capacity (vph) | 1141 | 1042 | 504 | 2210 | 2108 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.11 | 0.08 | 0.57 | 0.24 | 0.26 |

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

15: Central Park Drive & Howden Blvd

<Future>PM
03-12-2020




















| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|------------------------|-------|------|-------|------|------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 110 | 78 | 266 | 493 | 242 | 258 |
| Future Volume (vph) | 110 | 78 | 266 | 493 | 242 | 258 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.7 | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 0.95 | 0.95 | |
| Frpb, ped/bikes | 1.00 | 1.00 | 1.00 | 1.00 | 0.98 | |
| Flpb, ped/bikes | 1.00 | 1.00 | 0.99 | 1.00 | 1.00 | |
| Frt | 1.00 | 0.85 | 1.00 | 1.00 | 0.92 | |
| Flt Protected | 0.95 | 1.00 | 0.95 | 1.00 | 1.00 | |
| Satd. Flow (prot) | 1807 | 1601 | 1733 | 3579 | 3251 | |
| Flt Permitted | 0.95 | 1.00 | 0.45 | 1.00 | 1.00 | |
| Satd. Flow (perm) | 1807 | 1601 | 820 | 3579 | 3251 | |
| Peak-hour factor, PHF | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Adj. Flow (vph) | 120 | 85 | 289 | 536 | 263 | 280 |
| RTOR Reduction (vph) | 0 | 70 | 0 | 0 | 119 | 0 |
| Lane Group Flow (vph) | 120 | 15 | 289 | 536 | 424 | 0 |
| Confl. Peds. (#/hr) | 4 | 4 | 20 | | | 20 |
| Heavy Vehicles (%) | 1% | 2% | 2% | 2% | 3% | 0% |
| Turn Type | Prot | Prot | Perm | NA | NA | |
| Protected Phases | 4 | 4 | | 2 | 2 | |
| Permitted Phases | | | 2 | | | |
| Actuated Green, G (s) | 8.7 | 8.7 | 28.1 | 28.1 | 28.1 | |
| Effective Green, g (s) | 8.7 | 8.7 | 28.1 | 28.1 | 28.1 | |
| Actuated g/C Ratio | 0.18 | 0.18 | 0.58 | 0.58 | 0.58 | |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | |
| Lane Grp Cap (vph) | 322 | 285 | 472 | 2060 | 1871 | |
| v/s Ratio Prot | c0.07 | 0.01 | | 0.15 | 0.13 | |
| v/s Ratio Perm | | | c0.35 | | | |
| v/c Ratio | 0.37 | 0.05 | 0.61 | 0.26 | 0.23 | |
| Uniform Delay, d1 | 17.6 | 16.6 | 6.8 | 5.2 | 5.0 | |
| Progression Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Incremental Delay, d2 | 1.5 | 0.2 | 5.8 | 0.3 | 0.3 | |
| Delay (s) | 19.2 | 16.8 | 12.6 | 5.5 | 5.3 | |
| Level of Service | B | B | B | A | A | |
| Approach Delay (s) | 18.2 | | | 8.0 | 5.3 | |
| Approach LOS | B | | | A | A | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 8.4 | HCM 2000 Level of Service | A |
| HCM 2000 Volume to Capacity ratio | 0.56 | | |
| Actuated Cycle Length (s) | 48.8 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 58.7% | ICU Level of Service | B |
| Analysis Period (min) | 15 | | |
| c Critical Lane Group | | | |

HCM Unsignalized Intersection Capacity Analysis
 16: Isabella Street & Vodden Street West

<Future>PM
 03-12-2020

| |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | |  | |  |  | | |  | | |  | |
| Sign Control | | Stop | | | Stop | | | Stop | | | Stop | |
| Traffic Volume (vph) | 20 | 235 | 8 | 25 | 375 | 59 | 30 | 164 | 59 | 52 | 52 | 39 |
| Future Volume (vph) | 20 | 235 | 8 | 25 | 375 | 59 | 30 | 164 | 59 | 52 | 52 | 39 |
| 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) | 22 | 255 | 9 | 27 | 408 | 64 | 33 | 178 | 64 | 57 | 57 | 42 |
| Direction, Lane # | EB 1 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | | |
| Volume Total (vph) | 286 | 27 | 472 | 275 | 156 | | | | | | | |
| Volume Left (vph) | 22 | 27 | 0 | 33 | 57 | | | | | | | |
| Volume Right (vph) | 9 | 0 | 64 | 64 | 42 | | | | | | | |
| Hadj (s) | 0.04 | 0.50 | -0.08 | -0.12 | -0.09 | | | | | | | |
| Departure Headway (s) | 6.7 | 7.1 | 6.5 | 6.7 | 7.1 | | | | | | | |
| Degree Utilization, x | 0.53 | 0.05 | 0.85 | 0.51 | 0.31 | | | | | | | |
| Capacity (veh/h) | 498 | 489 | 541 | 494 | 451 | | | | | | | |
| Control Delay (s) | 16.9 | 9.3 | 35.1 | 16.5 | 13.2 | | | | | | | |
| Approach Delay (s) | 16.9 | 33.7 | | 16.5 | 13.2 | | | | | | | |
| Approach LOS | C | D | | C | B | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Delay | | | 23.2 | | | | | | | | | |
| Level of Service | | | C | | | | | | | | | |
| Intersection Capacity Utilization | | | 55.2% | ICU Level of Service | B | | | | | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 17: Lansdowne Drive/Lakeridge Drive & Vodden Street East

<Future>PM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|-------|------|------|------|------|------|------|
| Lane Configurations | ↗ | ↘ | | ↗ | ↘ | | | ↕ | | | ↕ | |
| Traffic Volume (veh/h) | 23 | 566 | 10 | 13 | 1041 | 10 | 2 | 1 | 11 | 12 | 2 | 12 |
| Future Volume (Veh/h) | 23 | 566 | 10 | 13 | 1041 | 10 | 2 | 1 | 11 | 12 | 2 | 12 |
| Sign Control | | Free | | | Free | | | Stop | | | Stop | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 25 | 615 | 11 | 14 | 1132 | 11 | 2 | 1 | 12 | 13 | 2 | 13 |
| Pedestrians | | 2 | | | 5 | | | 3 | | | 7 | |
| Lane Width (m) | | 3.6 | | | 3.6 | | | 3.7 | | | 3.7 | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | 1.1 | |
| Percent Blockage | | 0 | | | 0 | | | 0 | | | 1 | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | None | | | None | | | | | | | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | 290 | | | | | | | |
| pX, platoon unblocked | 0.56 | | | | | | 0.56 | 0.56 | | 0.56 | 0.56 | 0.56 |
| vC, conflicting volume | 1150 | | | 629 | | | 1850 | 1852 | 628 | 1855 | 1852 | 1146 |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 876 | | | 629 | | | 2123 | 2127 | 628 | 2133 | 2127 | 870 |
| tC, single (s) | 4.1 | | | 4.1 | | | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 2.2 | | | 2.2 | | | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 |
| p0 queue free % | 94 | | | 99 | | | 88 | 96 | 98 | 27 | 92 | 93 |
| cM capacity (veh/h) | 434 | | | 960 | | | 17 | 26 | 483 | 18 | 26 | 197 |
| Direction, Lane # | EB 1 | EB 2 | WB 1 | WB 2 | NB 1 | SB 1 | | | | | | |
| Volume Total | 25 | 626 | 14 | 1143 | 15 | 28 | | | | | | |
| Volume Left | 25 | 0 | 14 | 0 | 2 | 13 | | | | | | |
| Volume Right | 0 | 11 | 0 | 11 | 12 | 13 | | | | | | |
| cSH | 434 | 1700 | 960 | 1700 | 83 | 32 | | | | | | |
| Volume to Capacity | 0.06 | 0.37 | 0.01 | 0.67 | 0.18 | 0.87 | | | | | | |
| Queue Length 95th (m) | 1.4 | 0.0 | 0.3 | 0.0 | 4.7 | 22.7 | | | | | | |
| Control Delay (s) | 13.8 | 0.0 | 8.8 | 0.0 | 57.7 | 298.3 | | | | | | |
| Lane LOS | B | | A | | F | F | | | | | | |
| Approach Delay (s) | 0.5 | | 0.1 | | 57.7 | 298.3 | | | | | | |
| Approach LOS | | | | | F | F | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 5.2 | | | | | | | | | |
| Intersection Capacity Utilization | | | 66.9% | | ICU Level of Service | | | | C | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 18: Howden Blvd & Lindridge Avenue/Leander Street

<Future>PM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|-------------|-------------|-------------|-------------|----------------------|-------------|------|------|------|------|------|------|
| Lane Configurations | | ↔ | | | ↔ | | ↗ | ↘ | | ↗ | ↘ | |
| Traffic Volume (veh/h) | 0 | 0 | 0 | 0 | 0 | 1 | 19 | 419 | 8 | 2 | 169 | 3 |
| Future Volume (Veh/h) | 0 | 0 | 0 | 0 | 0 | 1 | 19 | 419 | 8 | 2 | 169 | 3 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 0 | 0 | 0 | 0 | 0 | 1 | 21 | 455 | 9 | 2 | 184 | 3 |
| Pedestrians | | | | | 2 | | | | | | | |
| Lane Width (m) | | | | | 3.7 | | | | | | | |
| Walking Speed (m/s) | | | | | 1.1 | | | | | | | |
| Percent Blockage | | | | | 0 | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage (veh) | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | 142 | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 688 | 698 | 186 | 692 | 694 | 462 | 187 | | | 466 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 688 | 698 | 186 | 692 | 694 | 462 | 187 | | | 466 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 100 | 100 | 100 | 100 | 100 | 100 | 98 | | | 100 | | |
| cM capacity (veh/h) | 355 | 358 | 857 | 353 | 359 | 603 | 1399 | | | 1104 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 0 | 1 | 21 | 464 | 2 | 187 | | | | | | |
| Volume Left | 0 | 0 | 21 | 0 | 2 | 0 | | | | | | |
| Volume Right | 0 | 1 | 0 | 9 | 0 | 3 | | | | | | |
| cSH | 1700 | 603 | 1399 | 1700 | 1104 | 1700 | | | | | | |
| Volume to Capacity | 0.00 | 0.00 | 0.02 | 0.27 | 0.00 | 0.11 | | | | | | |
| Queue Length 95th (m) | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | | | | | | |
| Control Delay (s) | 0.0 | 11.0 | 7.6 | 0.0 | 8.3 | 0.0 | | | | | | |
| Lane LOS | A | B | A | | A | | | | | | | |
| Approach Delay (s) | 0.0 | 11.0 | 0.3 | | 0.1 | | | | | | | |
| Approach LOS | A | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 0.3 | | | | | | | | | |
| Intersection Capacity Utilization | | | 32.5% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

HCM Unsignalized Intersection Capacity Analysis
 19: Hanover Road & Homeland Ct/Huntington Ct

<Future>PM
 03-12-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-----------------------------------|------|------|-------|------|----------------------|------|------|------|------|------|------|------|
| Lane Configurations | | ↕ | | | ↕ | | ↗ | ↘ | | ↗ | ↘ | |
| Traffic Volume (veh/h) | 9 | 0 | 4 | 8 | 1 | 13 | 7 | 142 | 8 | 21 | 143 | 13 |
| Future Volume (Veh/h) | 9 | 0 | 4 | 8 | 1 | 13 | 7 | 142 | 8 | 21 | 143 | 13 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 10 | 0 | 4 | 9 | 1 | 14 | 8 | 154 | 9 | 23 | 155 | 14 |
| Pedestrians | | 21 | | | 1 | | | 10 | | | | |
| Lane Width (m) | | 3.7 | | | 3.7 | | | 3.6 | | | | |
| Walking Speed (m/s) | | 1.1 | | | 1.1 | | | 1.1 | | | | |
| Percent Blockage | | 2 | | | 0 | | | 1 | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage veh | | | | | | | | | | | | |
| Upstream signal (m) | | | | | | | | | | | 205 | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 414 | 409 | 193 | 390 | 412 | 160 | 190 | | | 164 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 414 | 409 | 193 | 390 | 412 | 160 | 190 | | | 164 | | |
| tC, single (s) | 7.1 | 6.5 | 6.5 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.5 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 98 | 100 | 99 | 98 | 100 | 98 | 99 | | | 98 | | |
| cM capacity (veh/h) | 515 | 510 | 771 | 546 | 511 | 890 | 1369 | | | 1425 | | |
| Direction, Lane # | EB 1 | WB 1 | NB 1 | NB 2 | SB 1 | SB 2 | | | | | | |
| Volume Total | 14 | 24 | 8 | 163 | 23 | 169 | | | | | | |
| Volume Left | 10 | 9 | 8 | 0 | 23 | 0 | | | | | | |
| Volume Right | 4 | 14 | 0 | 9 | 0 | 14 | | | | | | |
| cSH | 569 | 702 | 1369 | 1700 | 1425 | 1700 | | | | | | |
| Volume to Capacity | 0.02 | 0.03 | 0.01 | 0.10 | 0.02 | 0.10 | | | | | | |
| Queue Length 95th (m) | 0.6 | 0.8 | 0.1 | 0.0 | 0.4 | 0.0 | | | | | | |
| Control Delay (s) | 11.5 | 10.3 | 7.6 | 0.0 | 7.6 | 0.0 | | | | | | |
| Lane LOS | B | B | A | | A | | | | | | | |
| Approach Delay (s) | 11.5 | 10.3 | 0.4 | | 0.9 | | | | | | | |
| Approach LOS | B | B | | | | | | | | | | |
| Intersection Summary | | | | | | | | | | | | |
| Average Delay | | | 1.6 | | | | | | | | | |
| Intersection Capacity Utilization | | | 30.3% | | ICU Level of Service | | | | A | | | |
| Analysis Period (min) | | | 15 | | | | | | | | | |

Timings
7: Rutherford Road North & Vodden Street East

<Future>PM
06-01-2020

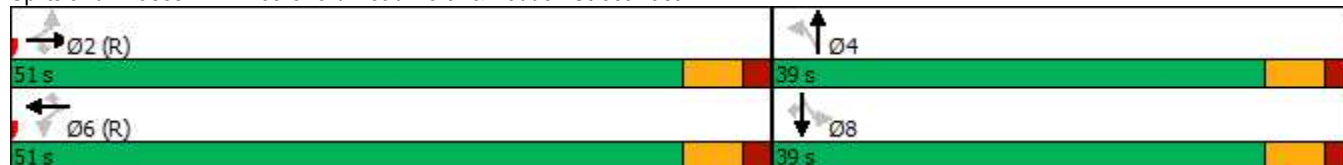


| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Lane Configurations | ↖ | ↗ | ↖ | ↖ | ↗ | ↖ | ↖ | ↗ | ↖ | ↗ | ↖ |
| Traffic Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 69 | 173 | 82 |
| Future Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 69 | 173 | 82 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | 8 | | 8 |
| Detector Phase | 2 | 2 | 2 | 6 | 6 | 6 | 4 | 4 | 8 | 8 | 8 |
| Switch Phase | | | | | | | | | | | |
| Minimum Initial (s) | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Minimum Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| Total Split (s) | 51.0 | 51.0 | 51.0 | 51.0 | 51.0 | 51.0 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 |
| Total Split (%) | 56.7% | 56.7% | 56.7% | 56.7% | 56.7% | 56.7% | 43.3% | 43.3% | 43.3% | 43.3% | 43.3% |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 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 | 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 | 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 | 6.0 | 6.0 | 6.0 |
| Lead/Lag | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | |
| Recall Mode | C-Max | C-Max | C-Max | C-Max | C-Max | C-Max | None | None | None | None | None |
| Act Effct Green (s) | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 31.1 | 31.1 | 31.1 | 31.1 | 31.1 |
| Actuated g/C Ratio | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| v/c Ratio | 0.63 | 0.50 | 0.11 | 0.19 | 0.62 | 0.18 | 0.40 | 0.86 | 0.66 | 0.27 | 0.14 |
| Control Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| LOS | C | B | A | B | C | A | C | D | E | C | A |
| Approach Delay | | 16.5 | | | 18.0 | | | 37.5 | | 25.1 | |
| Approach LOS | | B | | | B | | | D | | C | |

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 23.8
 Intersection LOS: C
 Intersection Capacity Utilization 97.7%
 ICU Level of Service F
 Analysis Period (min) 15

Splits and Phases: 7: Rutherford Road North & Vodden Street East



7: Rutherford Road North & Vodden Street East

06-01-2020



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | SBL | SBT | SBR |
|------------------------|-------|-------|------|------|-------|------|------|--------|-------|-------|------|
| Lane Group Flow (vph) | 175 | 488 | 93 | 69 | 610 | 155 | 167 | 550 | 70 | 175 | 83 |
| v/c Ratio | 0.63 | 0.50 | 0.11 | 0.19 | 0.62 | 0.18 | 0.40 | 0.86 | 0.66 | 0.27 | 0.14 |
| Control Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.6 | 15.5 | 3.2 | 15.8 | 21.5 | 5.0 | 25.2 | 41.3 | 56.6 | 21.9 | 5.2 |
| Queue Length 50th (m) | 24.6 | 64.0 | 3.8 | 6.3 | 74.3 | 0.4 | 20.9 | 82.5 | 9.8 | 20.8 | 0.0 |
| Queue Length 95th (m) | #54.2 | 99.0 | m5.7 | 17.3 | 132.0 | 15.8 | 37.7 | #135.1 | #30.7 | 35.8 | 8.7 |
| Internal Link Dist (m) | | 358.4 | | | 418.5 | | | 288.8 | | 340.1 | |
| Turn Bay Length (m) | 50.0 | | 50.0 | 48.5 | | 48.5 | 47.5 | | 41.5 | | 44.5 |
| Base Capacity (vph) | 278 | 973 | 815 | 370 | 983 | 872 | 440 | 678 | 112 | 684 | 614 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.63 | 0.50 | 0.11 | 0.19 | 0.62 | 0.18 | 0.38 | 0.81 | 0.63 | 0.26 | 0.14 |

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

7: Rutherford Road North & Vodden Street East

<Future>PM
06-01-2020



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------|-------|------|------|------|------|------|------|-------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 97 | 69 | 173 | 82 |
| Future Volume (vph) | 173 | 483 | 92 | 68 | 604 | 153 | 165 | 447 | 97 | 69 | 173 | 82 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.7 | 3.5 | 3.7 | 3.5 |
| Total Lost time (s) | 6.0 | 6.0 | 6.0 | 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 | | 1.00 | 1.00 | 1.00 |
| Frpb, ped/bikes | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.97 | 1.00 | 0.99 | | 1.00 | 1.00 | 0.98 |
| Flpb, ped/bikes | 1.00 | 1.00 | 1.00 | 0.99 | 1.00 | 1.00 | 1.00 | 1.00 | | 0.99 | 1.00 | 1.00 |
| Frt | 1.00 | 1.00 | 0.85 | 1.00 | 1.00 | 0.85 | 1.00 | 0.97 | | 1.00 | 1.00 | 0.85 |
| Flt Protected | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 1.00 | | 0.95 | 1.00 | 1.00 |
| Satd. Flow (prot) | 1781 | 1868 | 1479 | 1765 | 1887 | 1537 | 1783 | 1828 | | 1776 | 1868 | 1532 |
| Flt Permitted | 0.28 | 1.00 | 1.00 | 0.38 | 1.00 | 1.00 | 0.64 | 1.00 | | 0.16 | 1.00 | 1.00 |
| Satd. Flow (perm) | 534 | 1868 | 1479 | 709 | 1887 | 1537 | 1200 | 1828 | | 308 | 1868 | 1532 |
| Peak-hour factor, PHF | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Adj. Flow (vph) | 175 | 488 | 93 | 69 | 610 | 155 | 167 | 452 | 98 | 70 | 175 | 83 |
| RTOR Reduction (vph) | 0 | 0 | 45 | 0 | 0 | 72 | 0 | 9 | 0 | 0 | 0 | 54 |
| Lane Group Flow (vph) | 175 | 488 | 48 | 69 | 610 | 83 | 167 | 541 | 0 | 70 | 175 | 29 |
| Confl. Peds. (#/hr) | 5 | | 18 | 18 | | 5 | 1 | | 11 | 11 | | 1 |
| Confl. Bikes (#/hr) | | | | | | 1 | | | | | | |
| Heavy Vehicles (%) | 0% | 2% | 3% | 0% | 1% | 1% | 0% | 1% | 0% | 0% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | Perm |
| Protected Phases | | 2 | | | 6 | | | 4 | | | 8 | |
| Permitted Phases | 2 | | 2 | 6 | | 6 | 4 | | | 8 | | 8 |
| Actuated Green, G (s) | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 31.1 | 31.1 | | 31.1 | 31.1 | 31.1 |
| Effective Green, g (s) | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 46.9 | 31.1 | 31.1 | | 31.1 | 31.1 | 31.1 |
| Actuated g/C Ratio | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.35 | 0.35 | | 0.35 | 0.35 | 0.35 |
| Clearance Time (s) | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 |
| Vehicle Extension (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lane Grp Cap (vph) | 278 | 973 | 770 | 369 | 983 | 800 | 414 | 631 | | 106 | 645 | 529 |
| v/s Ratio Prot | | 0.26 | | | 0.32 | | | c0.30 | | | 0.09 | |
| v/s Ratio Perm | c0.33 | | 0.03 | 0.10 | | 0.05 | 0.14 | | | 0.23 | | 0.02 |
| v/c Ratio | 0.63 | 0.50 | 0.06 | 0.19 | 0.62 | 0.10 | 0.40 | 0.86 | | 0.66 | 0.27 | 0.05 |
| Uniform Delay, d1 | 15.4 | 14.0 | 10.7 | 11.4 | 15.3 | 10.9 | 22.4 | 27.4 | | 25.0 | 21.3 | 19.6 |
| Progression Factor | 0.95 | 0.93 | 1.07 | 1.13 | 1.13 | 1.87 | 1.00 | 1.00 | | 1.00 | 1.00 | 1.00 |
| Incremental Delay, d2 | 8.7 | 1.5 | 0.1 | 1.1 | 2.9 | 0.3 | 1.3 | 12.1 | | 18.6 | 0.5 | 0.1 |
| Delay (s) | 23.3 | 14.5 | 11.6 | 14.0 | 20.2 | 20.7 | 23.7 | 39.5 | | 43.6 | 21.7 | 19.7 |
| Level of Service | C | B | B | B | C | C | C | D | | D | C | B |
| Approach Delay (s) | | 16.2 | | | 19.8 | | | 35.8 | | | 25.9 | |
| Approach LOS | | B | | | B | | | D | | | C | |

Intersection Summary

| | | | |
|-----------------------------------|-------|---------------------------|------|
| HCM 2000 Control Delay | 23.9 | HCM 2000 Level of Service | C |
| HCM 2000 Volume to Capacity ratio | 0.72 | | |
| Actuated Cycle Length (s) | 90.0 | Sum of lost time (s) | 12.0 |
| Intersection Capacity Utilization | 97.7% | ICU Level of Service | F |
| Analysis Period (min) | 15 | | |

c Critical Lane Group